Operation Manual

Bad River Band
Odanah Community
Wastewater Treatment Plant
Operation Manual

Prepared by:

Earth Tech
4738 North 40th Street
Sheboygan, WI 53083

May 2002

TABLE OF CONTENTS

Page

DIVISION 700 – EFFLUENT PUMP STATION AND FORCE MAIN

DIVISION 800 – ALUM FEED SYSTEM

DIVISION 900 – AEROBIC DIGESTION

DIVISION 1000 – ENGINE GENERATOR

LIST OF FIGURES

Figure **Follows Page**

DIVISION 100

INTRODUCTION

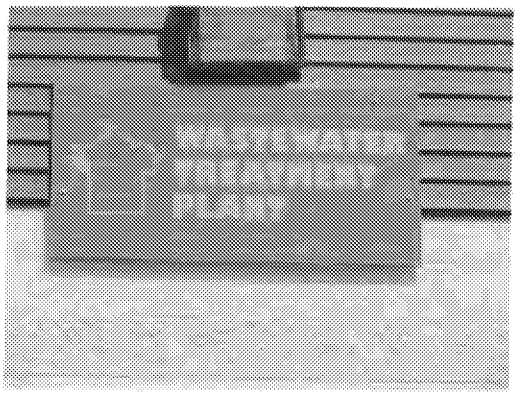
DIVISION 100

INTRODUCTION

110 PURPOSE OF MANUAL

The wastewater treatment plant for the Odanah Community is a complex combination of mechanical and electrical equipment working together to treat wastewater from the collection system.

The purpose of this operations manual is to provide instruction and guidance on how to operate and control the processes and equipment.



120 CONTENTS OF MANUAL

The manual is divided into divisions containing specific information with emphasis on distinct areas of treatment plant operation, as follows:

Division	
100	Introduction
200	Facility Description
300	Lift Station No.1
400	Preliminary Treatment
500	Sequencing Batch Reactors
600	Ultra Violet Disinfection
700	Effluent Pump Station and Force Main
800	Alum Feed System
900	Aerobic Digestion
1000	Standby Engine Generator

Appendices

- Design Basis
- Jet Tech – Various Papaers
- NPDES Permit

DIVISION 200

FACILITY DESCRIPTION

LIST OF FIGURES

DIVISION 200

FACILITY DESCRIPTION

210 FACILITY OVERVIEW

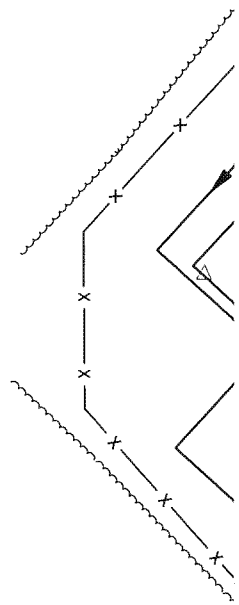
The Bad River Band's Odanah Community wastewater treatment plant was upgraded and expanded in 2002. Figure-Site Plan shows the layout of the plant.

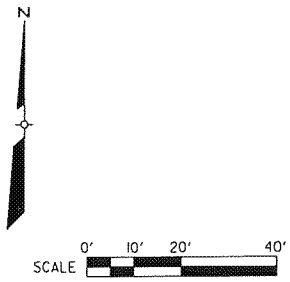
The key processes of the wastewater treatment plant include:

- Raw Wastewater Lift Station No.1
- Raw Wastewater Screening
- Equalization Basins
- Sequencing Batch Reactors
- Ultraviolet Disinfection
- Effluent Pump Station and Force Main
- Aerobic Digestion
- Standby Engine Generator

The Design Memo is included in Appendix A. The plant design is based on a design average flow of 140,000 gallons per day of raw sewage.

Figure-Hydraulic Profile shows the hydraulic profile for the Odanah Community plant and illustrates the processes and flow through the plant.

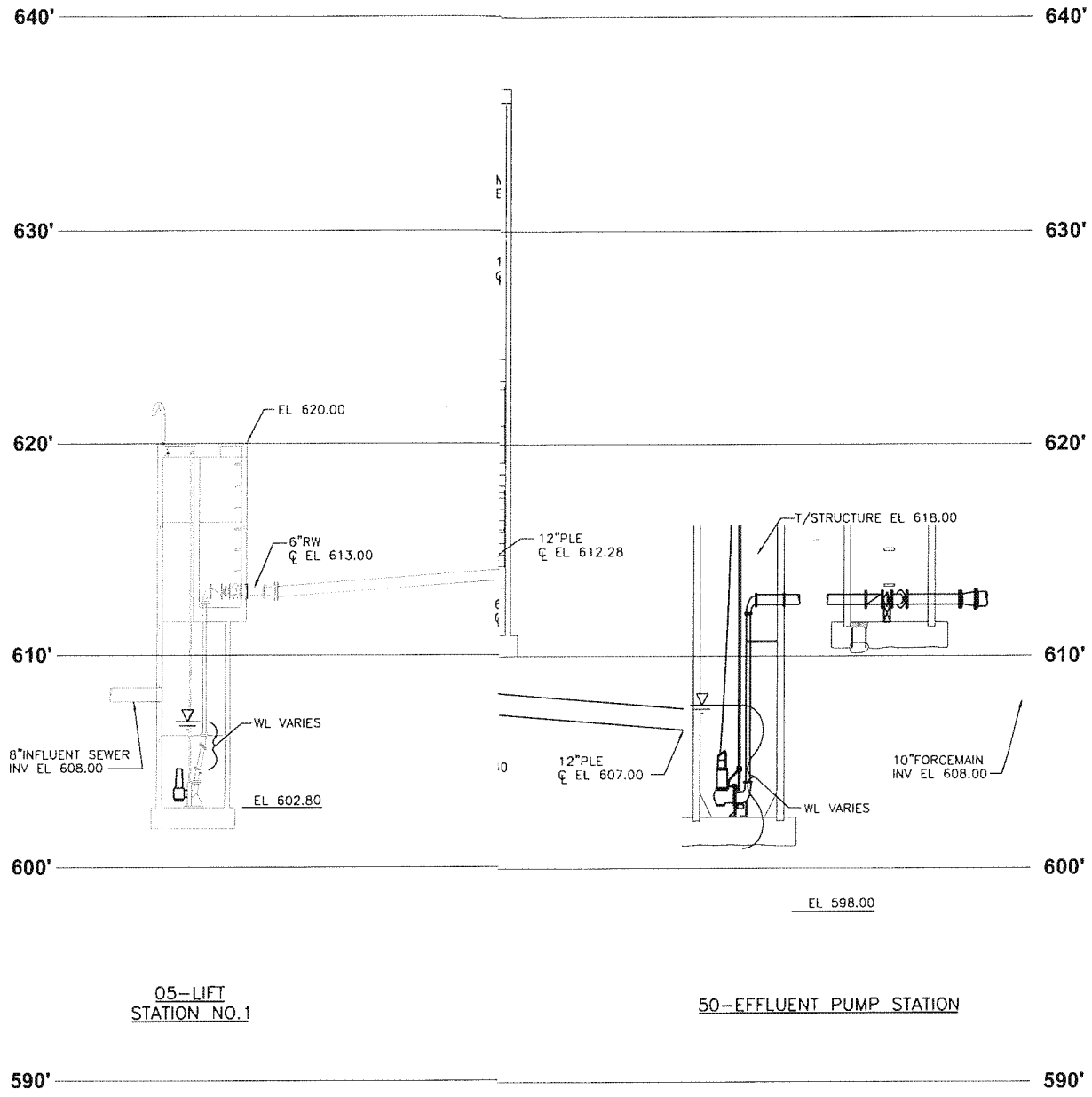




FIGURE

SITE PLAN

BAD RIVER BAND ODANAH COMMUNITY WWTP



NOTES:

1. INFLUENT SEWAGE FLOW – PEAK HOURLY FLOW 0.673mgd.
2. MAX DECANT RATE FROM SBR – 680gpm.

FIGURE
HYDRAULIC PROFILE

BAD RIVER BAND ODANAH COMMUNITY WWTP

File: L:\WORK\44037\CADD\onm figures\01G11.dwg Time: Apr 23, 2002 - 10:30am

220 PROCESS DESCRIPTION

221 Lift Station No.1

Wastewater from the Odanah area collection system ultimately discharges to Lift Station No.1. Lift Station No.1 is approximately 900 feet down Evergreen Street from the Odanah plant. The raw wastewater is pumped from the Lift Station to the wastewater plant through a 6-inch force main.

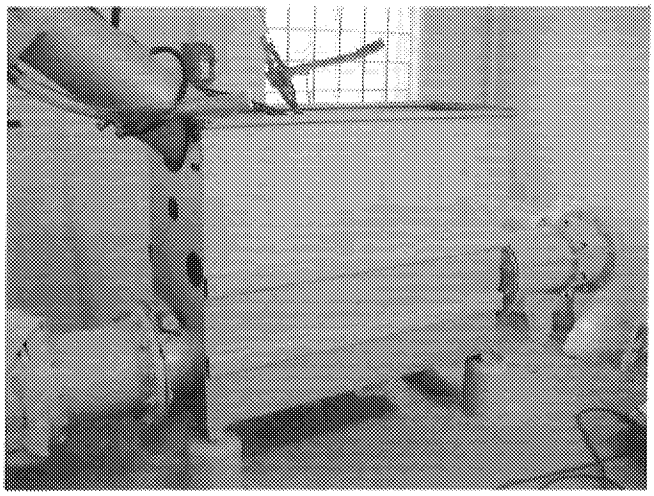
There are two constant speed pumps in the Lift Station. One pump starts when raw sewage level rises to the start setpoint, and shuts off when the sewage level drops to the stop setpoint.

Figure-Site Plan shows a cluster of manholes on the northeast side of the plant site. In these manholes are manual valves that may be opened to divert the flow to the lagoons rather than the plant in case of major breakdown.

222 Preliminary Treatment

Wastewater from Lift Station No.1 is pumped to the Screen/UV Building. Raw wastewater flow rate is measured by the Influent Flow Meter.

Raw wastewater flows through the cylindrical fine screen. The screenings are collected in containers in the Screen/UV Building.



After screening, the Influent Sampler collects a composite sample of the wastewater.

The screened wastewater (secondary influent) flows by gravity to the Sequencing Batch Reactors.

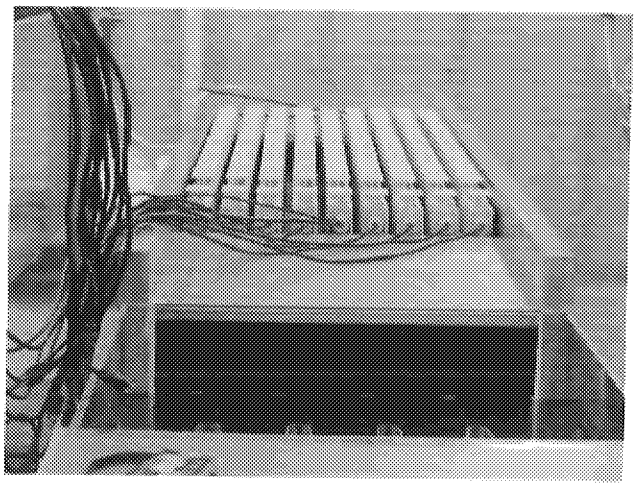
223 Secondary Treatment

Screened wastewater (secondary influent) flows to the sequencing batch reactors (SBR). The SBR is a fill-and-draw, non-steady state activated sludge process. Within the same tank, the SBR process performs:

- Anoxic and/or aerated fill for biological nutrient removal and discouragement of filamentous organisms
- aeration during biodegradation
- sedimentation/clarification operations
- Activated sludge wasting

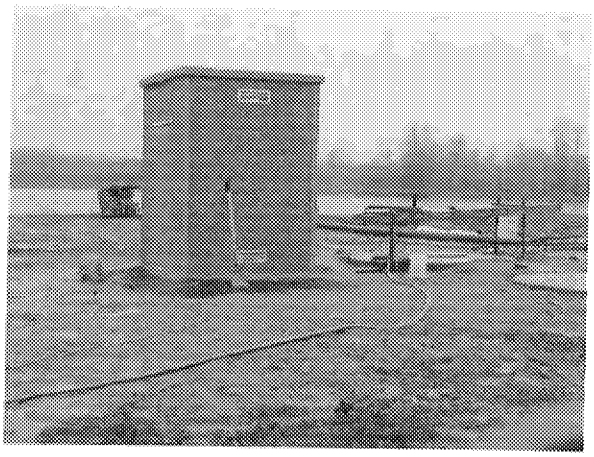
The microorganisms living in the mixed liquor of the SBR consume the pollutants in the wastewater.

224 UV Disinfection



After the clarification stage of the SBR process, the effluent is released to flow through the Effluent Flow Meter, and through the UV Channel where disinfection occurs by lethal doses to organisms of ultraviolet light. Following UV disinfection, composite samples of the effluent are collected for laboratory analysis.

225 Effluent Pump Station and Force Main

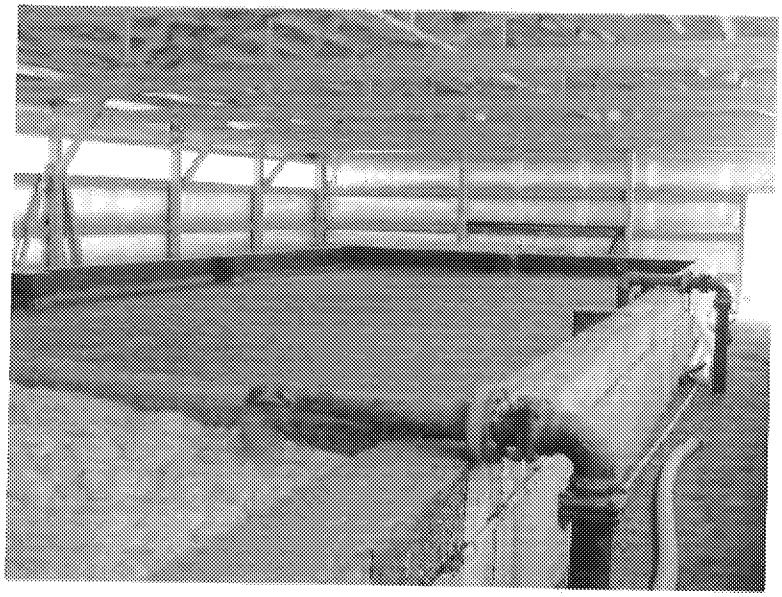


Plant effluent flows to the Effluent Pump Station. The effluent is pumped through a force main for 2 miles to discharge into the Bad River.

226 Aerobic Digestion

During the clarification stage of the SBR process, the microorganisms and other solids (activated sludge) settle to the bottom. A portion of the settled material is wasted to reduce excess sludge. The removed excess sludge is called waste activated sludge (WAS). WAS is pumped to the aerobic digester.

There is one aerobic digester tank with air diffusers and one blower. WAS solids have an average detention time in the Aerobic Digester of 20 to 60 days.



The blower operates intermittently to maintain sufficient dissolved oxygen in the sludge to satisfy the microorganisms. Occasionally, supernatant is decanted off, while settled solids are pumped to the lagoon.

227 Alum Feed System

The SBR process is capable of reducing phosphorus through biological removal. However, if the SBR system is not removing sufficient phosphorus, a backup system of alum feed equipment is provided. Alum will combine with phosphorous to precipitate/remove phosphorus.

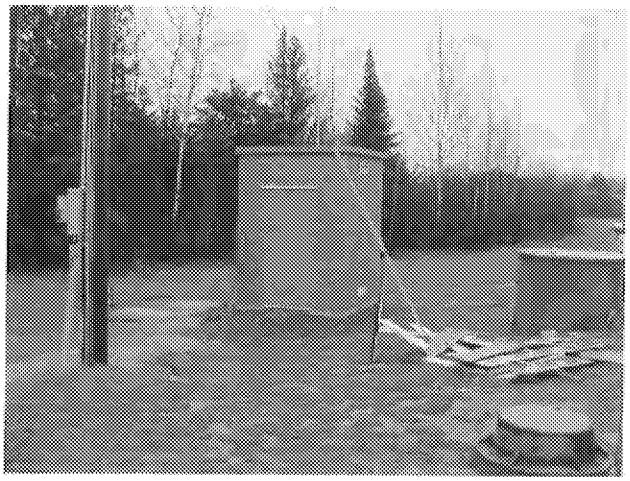
DIVISION 300

LIFT STATION No.1

LIST OF FIGURE

DIVISION 300

LIFT STATION No.1



310 DESCRIPTION OF LIFT STATION No.1

Lift Station No.1 is located approximately 900 feet southwest of the treatment plant, down Evergreen Street. All wastewater enters this lift station for pumping to the Odanah WWTP. Figure-Lift Station No.1 shows views of the lift station.

The lift station has two submersible non-clog raw wastewater pumps.

Lift Station No.1 Pumps Characteristics	
Pump tag numbers	P-1-1-1, and –2
Manufacturer	ABS
Speed	Constant
Pump speed	1780 rpm
Capacity	470 gpm at 53' head
Motor horsepower	14.1
Volts/amps/phases	230/38.8/3
Motor speed	1780 rpm

The operator selects each pump to be either LEAD or LAG pump.

There is a submersible level transducer in the lift station, LE/LIT –1-2-1,

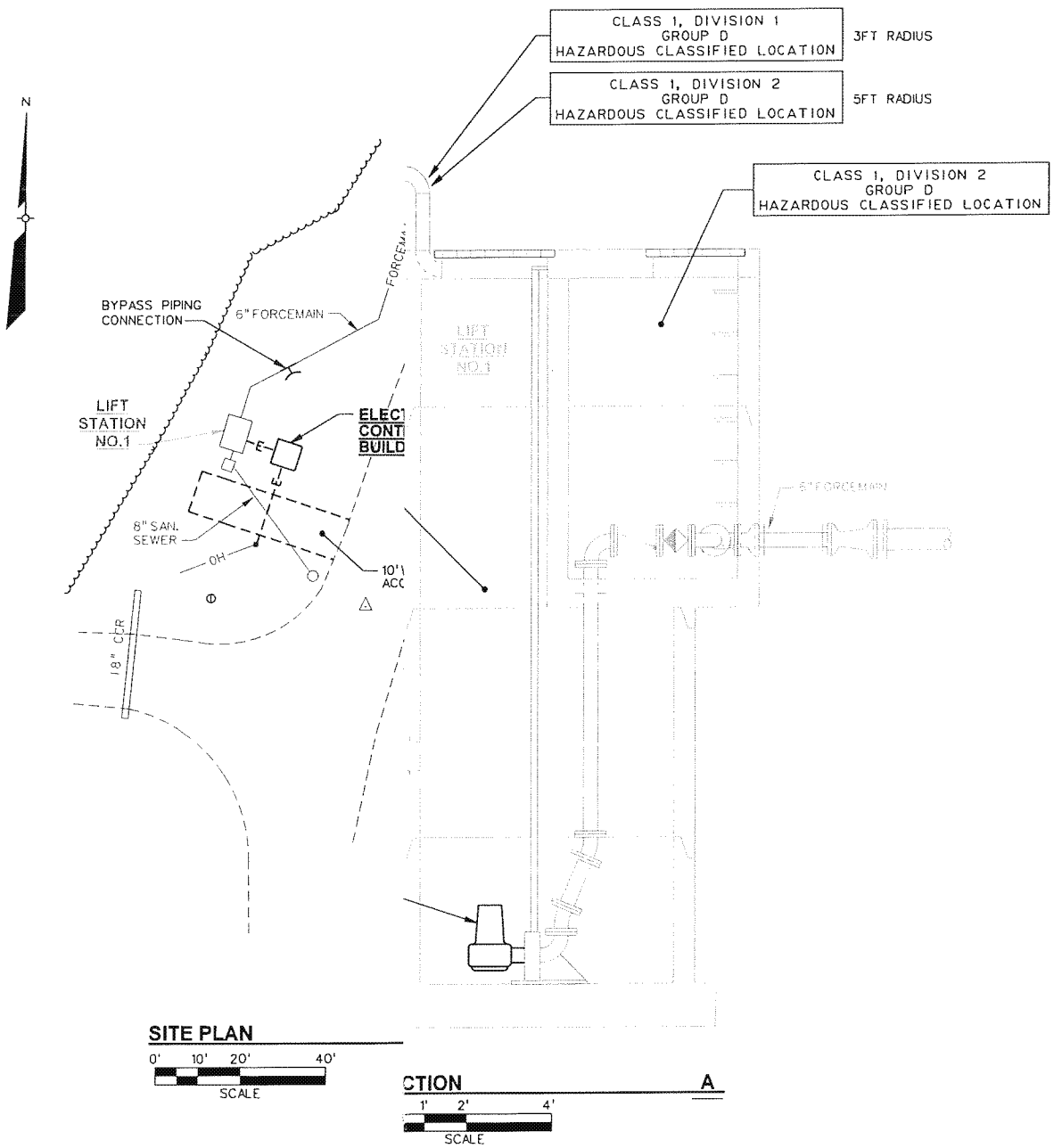


FIGURE
LIFT STATION NO.1

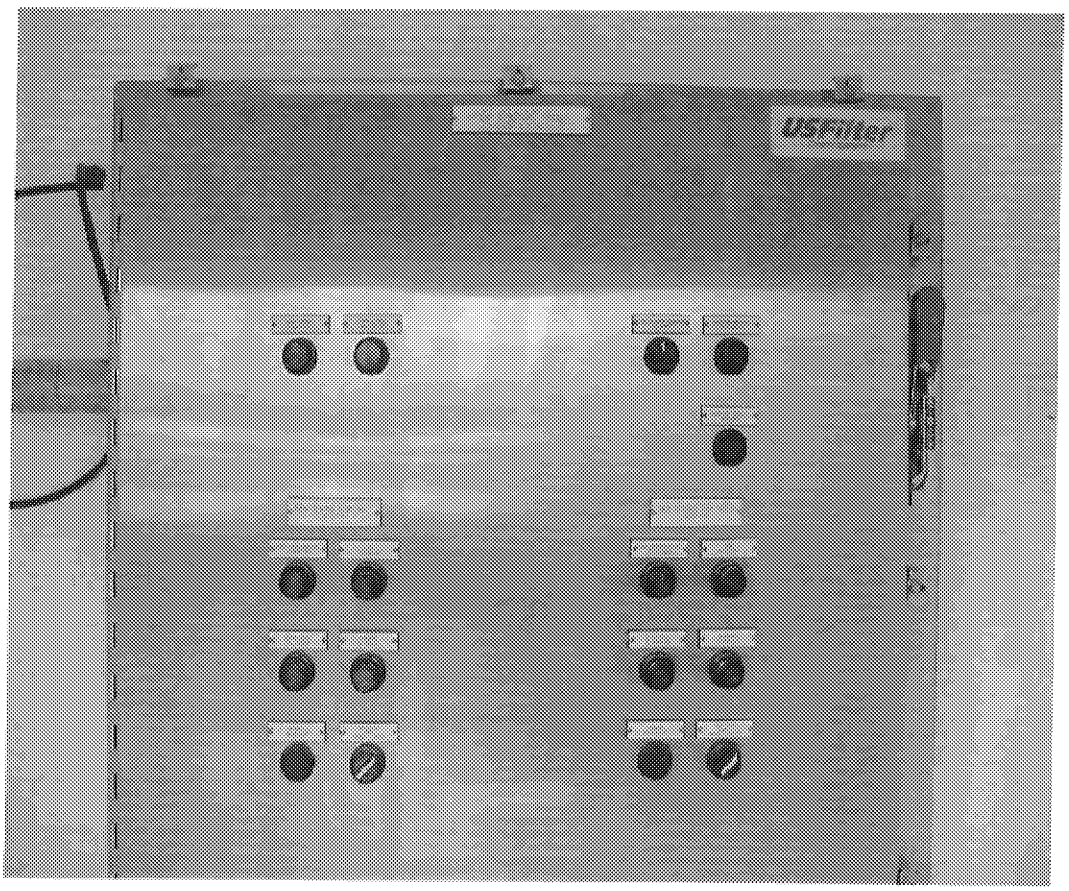
BAD RIVER BAND ODANAH COMMUNITY WWTP

that measures liquid level. It is has a range of 0 to 10 feet. Liquid level signals are sent to Lift Station No.1 Control Panel. The base of the lift station is elevation 602.8 feet.

Liquid Level Control Points	
LAG pump on	5.6 feet
LEAD pump on	4.6 feet
LAG pump off	3.0 feet
LEAD pump off	2.6 feet

There is a high-level float switch mounted at 5.7 feet.
There is a low-level float switch mounted at 1.7 feet.

320 LIFT STATION No.1 CONTROLS



The pumps are controlled from Lift Station No.1 Control Panel, 05-LCP-1-2.

The main control devices on the Control Panel include:

- HAND-OFF-AUTO switch for each pump (outer panel door)
- 1-2/2-1/ALT selector switch (inner panel door)
- LEAD and LAG pump start/stop levels (inner panel door)

In HAND, a pump will run continuously. In OFF, a pump is prevented from running. In AUTO, a pump will start and stop according to the liquid level control points and the selector switch position.

If "1-2" is selected, pump #1 is always LEAD and pump #2 is always LAG. If "2-1" is selected, the roles are reversed. If "ALT" is selected, the pumps automatically alternate LEAD and LAG roles each time they are called to run.

The RESET buttons must be manually pushed after pump fail, motor high temperature, or seal leak fail.

The high level float switch or the low-level float switch will send the Lift Station No.1 Control Panel into "Backup mode."

- If the high-level float switch is reached, Backup mode will call for the LEAD pump to run.
- If the high float is still floating after _ minutes, the LAG pump will start
- On decreasing level, when the low float is reached, the LEAD pump will stop
- If the low level continues after _ minutes, the LAG pump will stop.
- The pumps will continue to operate under the control of the high float switch and low float switch
- Pressing BACKUP RESET button may return pumps to normal control under the pressure transducer signals

On the inner control panel door, the operator can use the "manual level simulator" to artificially run the liquid level up or down to test operation signals to the pumps.

330 LIFT STATION No.1 OPERATION

Normal Lift Station operation is accomplished by:

- Switching the "1-2/2-1/ALT" selector switch to "ALT"
- Placing the control switch for each pump in AUTO

The pumps will automatically start and stop in accordance with liquid levels in the lift station, and will alternate LEAD and LAG roles. The operator may adjust the LEAD and LAG pump start and stop levels at the control panel inner door by pulling and replacing the pegs. The operator should select the start and stop levels to accomplish relatively even feed of raw sewage to the plant without causing excessive start/stop cycling of the pumps.

If a pump must be taken out of service, turn its switch to OFF. Put the pumps disconnect switch (on the motor control center) to OFF. Lockout/Tagout the disconnect switch, if appropriate.

DIVISION 400

PRELIMINARY TREATMENT FACILITIES

DIVISION 400

Preliminary Treatment Facilities

Preliminary treatment includes three components:

- Raw wastewater flow meter
- Fine screening
- Influent sampling

Wastewater from Lift Station No.1 enters the basement of the Screen/UV Building through a 6-inch force main. The flow goes through the influent flow meter, up to first floor, and then discharges into the cylindrical fine screen. After screening, the wastewater flows by gravity back to the basement where influent samples are collected.

The wastewater flows from the screen/UV Building basement to the Equipment Building where the valves and pipes distribute flow to the equalization basins.

410 INFLUENT FLOW METER

The Raw Wastewater flow Meter (FE/FIT-1-5-1) is on the 6-inch force main entering the basement of the Screen/UV Building. The flow meter range is 0 – 11,200 gallons per minute (gpm). Typical flow rates are 0-470 gpm. The flow meter is activated by switching on its circuit breaker in lighting panel 10LP1 in the Electrical Room of the Screen/UV Building. The flow signal from the meter is sent to the plant PLC where it is scaled and then read by the SBR PLC where it is totalized. The flow signal is used to pace the influent sampler

420 FINE SCREENING

421 DESCRIPTION

Debris is carried with the raw wastewater flow. If not removed, the debris will decrease the tank volume and may clog pumps and piping downstream. Debris is removed by the cylindrical fine screen. The flow enters the center of cylindrical fine screen and flows though the screen on the outside. The screen basket catches floating, settable, and suspended material on the inside. The cylindrical screen is inclined at an angle of 35 degrees to the direction of flow. Waste materials are cleaned off the screen by a screw conveyor with plastic bristles, and transported up the inclined screen. The screw conveyor continues

transporting the waste material up the inclined tube. The materials are mixed and squeezed by the screw on their way up the transport tube. Filtrate from the material drains back to the channel. The compacted material drops into a container.

Cylindrical Fine Screen M-1-6-1 Characteristics	
Manufacturer	Huber
Capacity	600 gpm
Screen basket diameter	18 inches
Orifice spacing	0.25
Screen width	20 inches
Screw conveyor diameter	10 inches
Motor horsepower	1.5
Volts/amps/phases	460/2.5/3
Spray wash supply	60 to 100 psig
Max spray wash supply	26 gpm

The primary screening wash valve opens to provide wash-water to the spray bar on the outside of the screen to help clear materials collecting on the inside of the screen. The secondary screenings wash valve opens to provide wash-water to clean the debris dewatering chamber.

422 CONTROLS

The raw wastewater screen is controlled from the Screen Control Panel (10-LCP-1-3) and Screen Remote Pushbutton Station (10-LCP-1-4). The Screen Remote Pushbutton Station is located in the Screen Room near the screen.

Screen Remote Pushbutton Station 10-LCP-1-4 Devices
LOCAL/REMOTE selector switch
FORWARD/OFF/REVERSE selector switch
LOCKOUT STOP switch

- In LOCAL the screw conveyor is controlled with the FORWARD-OFF-REVERSE selector switch on this station.
- In REMOTE control is from the automatic functions on Screen Control Panel, 10-LCP-1-3.
- The LOCKOUT STOP switch is active in both LOCAL or REMOTE and will prevent the screw conveyor from running.

The Screen Control Panel is located in the Electrical Room.

Screen Control Panel 10-LCP-1-3 Devices
Operator Interface Unit
HAND/OFF/AUTO switch
System RESET button
Wash valve HAND/OFF/AUTO switch
Screen overload RESET button
High level sensor, LSH-1-7-1, in Screen Tank

- In HAND, the PLC is bypassed and the screw conveyor runs continuously.

- In AUTO, the screw conveyor starts when high water level reaches the high level sensor, LSH-1-7-1. The screw continues to operate with high water level and for set duration (60 minutes) after water level is no longer high. The screen reverses direction after operating for a set duration.

- The wash water solenoid valves cycle open and closed based on timers, when the screen runs in AUTO. These timers are adjustable on the Operator Interface Unit.

423 OPERATIONS

The fine screen is normally operated in AUTO mode. Therefore at the Screen Remote Pushbutton Station the LOCAL/REMOTE switch should be in REMOTE; and at the Screen Control Panel the HAND/OFF/AUTO switch should be in AUTO.

As materials build up on the inside and plug the screen, the water level will rise until the high level sensor is reached. The screen screw conveyor and wash cycle will automatically start. If the duration of the screen operation exceeds 90 seconds, the screen auger stops for 1.5 seconds and reverses for 7 seconds. After a pause of 1.5 seconds, the auger resumes forward rotation (counter clockwise facing the non-drive end).

At the end of every screen operation, the dewatering chamber wash solenoid opens for 10 seconds to flush the chamber and prevent solids buildup. Also, the dewatering chamber wash-down cycle will occur if the screen operates continuously for 15 minutes.

430 INFLUENT SAMPLER

The influent sampler, M-1-10-1, draws a sample from the secondary influent pipe at the south end of the Screen/UV Building basement. The sampler is on the first floor in the Electrical Room.

The sampler receives 120 volt electrical power from lighting panel, 10LP1. It receives a flow signal from the Plant PLC to pace the sample intervals.

DIVISION 500

SEQUENCING BATCH REACTOR SYSTEM

DIVISION 500

Sequencing Batch Reactor System

510 OVERVIEW

The Sequencing Batch Reactor (SBR) is a fill and draw activated sludge treatment process that operates in batch mode. The SBR treatment cycle consists of a timed sequence that includes the following steps: FILL, REACT, SETTLE, DECANT, SLUDGE WASTING and IDLE – all in the same tank.

SBR operation is flexible and can provide secondary treatment, nitrification, denitrification, and biological nutrient removal by adjustment of the timed sequence.

The Odanah Community SBR system includes two Influent Equalization Basins that were converted from previous SBR tanks. The two SBR tanks and the two Influent EQ Basins are designed to operate together. Raw influent will be directed to one of the Influent EQ Basins and will be allowed to flow between the basins through a gate in the wall between the two. Raw influent will be stored in the Influent EQ Basins until an SBR is ready to receive influent, at which point it will be transferred rapidly to one of the SBRs.

Influent EQ Motive Pumps provide mixing in the Influent EQ Basins and transfer influent to the SBRs. Raw influent can enter either Influent EQ Basin, and either Influent EQ Basin can transfer to either SBR. The system will alternate between sending raw influent first to one then the other Influent EQ Basin. Whichever basin is receiving influent, the other basin is designated to transfer to the SBRs.

The SBRs will alternate receiving influent. Each batch of influent is treated and clarified before being discharged. The SBRs will operate using the Slug Feed control strategy. In this mode there does not have to be an SBR in fill all the time, in fact most of the time there will not be an SBR in fill. When an SBR enters fill a batch will be transferred from the Influent EQ basins in a short amount of time.

The control system only allows one SBR to be in Fill at a time. It will also only allow one SBR to be in Decant at a time. Other than that the SBRs will operate independently.

HOW THE INFLUENT EQ BASINS WORK

At any given time, one Influent EQ Basin is selected to receive influent flow and the other basin is selected to transfer to the SBRs. Fill and Transfer designation will be alternated between the basins after each transfer to the SBRs.

Each Influent EQ Basin can independently go through the following steps:

- ANOXIC STATIC – No mixing or aeration will take place in the basin. The basin will remain in this step until the **Anoxic Static Time** setpoint has expired, at which point it will proceed to Anoxic Mixed.

- ANOXIC MIXED – The contents of the basin are mixed by the respective Influent EQ Motive Pump. No aeration will take place in the basin. The basin will remain in this step until the **Anoxic Mix Time** setpoint has expired, at which point it will proceed to Aeration.

- AERATION – The contents of the basin are mixed and aerated by the respective Influent EQ Motive Pump and Influent EQ Blower. The basin will remain in this step until the **Aeration Duration** setpoint has expired, at which point it will return to Anoxic Static.

- VACFLUSH – The motive pump suction and discharge valves are called to close and the vacflush suction and vacflush discharge valves are called to open. The Influent EQ Motive Pump then runs to reverse the liquid flow through the jet header nozzles. This reverse flow cleans buildup from the inside of the nozzles. Each Influent EQ Basin will go in to the Vacflush step once per day. The basin will remain in this step until the **Vacflush Duration** setpoint has expired, at which point it will return to Anoxic Static.

- TRANSFER – No mixing or aeration will take place in the basin. The respective return valve will open and the Influent EQ Motive Pump will run to transfer influent to the SBRs. The basin will remain in this step until the fill in the SBR has ended, at which point it will return to Anoxic Static.

HOW THE SBRS WORK

The sequence of operation goes through 5 stages:

- FILL – The SBR fills with secondary influent from the Influent EQ Basins. The fill step can be aerated, anoxic or a combination of the two. Fill is distributed either through the settled sludge though the Influent Distribution (ID/SC) manifold if the basin is in a static status, or is pumped through the jet aeration pipe if the basin is in a mixed status.

- REACT – Mixed liquor is drawn from the SBR through the Sludge Collection (ID/SC) manifold to the SBR Motive pump and discharged back to the SBR though the jet aeration pipe. Blowers run to blow air through the jet aeration pipe. Aeration and mixing continue until biodegradation is achieved. Aeration to the SBR can be periodically turned on and off during React to achieve nitrification and denitrification.

- SETTLE – Blowers and motive pump are turned off to achieve quiescent conditions. The biomass settles leaving treated supernatant above.

- DECANT – Treated effluent is drained from below the liquid surface by the floating Decanter.

- IDLE/WASTE SLUGE – The SBR waits for the next sequence to begin. Some of the solids can be wasted during this stage. Settled sludge is drawn through the ID/SC manifold and pumped by the SBR motive pump to the aerobic digester.

520 CONTROL SYSTEM

All equipment associated with the Influent EQ Basins and the SBRs are controlled from the SBR Control Panel (40-LCP-2-1). The follow is a list summarizing the equipment and equipment functionality provided by the control panel:

- Programmable Logic Controller (PLC)
  - ⇒ Allen-Bradley CompactLogix 1769-L33ER processor
  - ⇒ Top PLC communications port connects to operator interface SCADA computers via Ethernet.
  - ⇒ PLC Program handles storage of setpoints, alarming, and cycling of equipment.
- Uninterruptible Power Supply
  - ⇒ APC Smart-UPS 750VA
  - ⇒ Maintains power to control panel equipment in the event of loss of control power.
- Surge Arrestor
  - ⇒ Transtector ACP-100MN
  - ⇒ Suppresses transient voltages in order to protect equipment
- Controlled Equipment
  - ⇒ SBR Blowers (qty. of 3)
    - * SBR Blower 1 (2-18-1) provides aeration to SBR 1.
    - * SBR Blower 2 (2-18-2) provides aeration to SBR 2.
    - * SBR Blower 3 (2-18-3) can provide aeration to either SBR through the air isolation valves.
    - * Blowers can be controlled manually via the HAND/OFF/AUTO selector switches on front of the control panel.
    - * Blowers will only be called to run in AUTO when the respective SBR is in an Aerated Fill or React step.
    - * Blower 3 will be called to run in place of either of the other blowers if that blower has failed or is not in AUTO.
    - * If the SBR is in a high level condition, aeration to that tank will be suspended.
    - * Blower fail will be alarmed if blower run is not detected within 10 seconds of blower being called to run. If a blower failure occurs that blower will not be called to run in automatic again until the blower failure is reset. The blower failure is reset by placing the HOA switch into the OFF position then back to the AUTO position.
    - * In the event of two blowers failing, both SBRs will remain in service and will continue to cycle through the treatment steps. This situation should be considered an emergency and the operator should correct the condition that caused the failure as quickly as possible. In order to avoid discharging

partially treated wastewater, the operator should consider making manual adjustments to take a basin out of service if necessary.

* Anti-cycle software timers prevent short cycling of blowers, set at 10 minutes from start to start.

⇒ SBR Blower Isolation Valves (qty. of 2)

* Blower Isolation Valve 1/3 (FV-2-19-1) will allow air from SBR Blower 3 to be directed to SBR 1.
* Blower Isolation Valve 2/3 (FV-2-19-2) will allow air from SBR Blower 3 to be directed to SBR 2.
* Valves can be controlled manually via the OPEN/CLOSE/AUTO selector switches on front of the control panel.
* Valves will not be called to open in AUTO unless SBR Blower 1 or SBR Blower 2 has failed or is not in AUTO.
* Valve failure will be alarmed if valve is not in the requested position within 120 seconds after valve is called to that position.

⇒ SBR Motive Pumps (qty. of 2)

* Motive Pump 1 (P-2-5-1) provides mixing and sludge wasting in SBR 1.
* Motive Pump 2 (P-2-5-1) provides mixing and sludge wasting in SBR 2.
* Pumps can be controlled manually via the HAND/OFF/AUTO selector switches on front of the control panel.
* Pumps will not be called to run in AUTO unless the respective SBR is in a mixing, aeration or waste sludge step.
* If the SBR is in a high level condition, aeration/mixing in that tank will be suspended.
* Pump fail will be alarmed if pump run is not detected within 5 seconds of pump being called to run.
* In the event of a motive pump failure, the SBR will remain in service and will continue to cycle through the treatment steps. This situation should be considered an emergency and the operator should correct the condition that caused the failure as quickly as possible. In order to avoid discharging partially treated wastewater, the operator should consider making manual adjustments to take a basin out of service if necessary.
* Anti-cycle software timers prevent short cycling of pumps, set at 10 minutes from start to start.

⇒ SBR Influent Valves (qty. of 2)

* Influent Valve 1 (2-4-1) will allow raw influent to be directed into SBR 1.
* Influent Valve 2 (2-4-2) will allow raw influent to be directed into SBR 2.
* Valves can be controlled manually via the OPEN/CLOSE/AUTO selector switches on front of the control panel.
* Valves will not be called to open in automatic unless the respective SBR is in a fill step.
* In the event of an influent valve failure, the SBR will remain in service and will continue to cycle through the treatment steps. This situation should be considered an emergency and the operator should correct the condition that caused the failure as quickly as possible. In order to avoid discharging

partially treated wastewater, the operator should consider making manual adjustments to take a basin out of service if necessary.

* Valve failure will be alarmed if valve is not in the requested position within 120 seconds after valve is called to that position.

⇒ SBR Effluent Valves (qty. of 2)

* Effluent Valve 1 (2-10-1) will allow supernatant to be decanted from SBR 1.
* Effluent Valve 2 (2-10-2) will allow supernatant to be decanted from SBR 2.
* Valves can be controlled manually via the MANUAL/AUTO selector switches on front of the control panel. When this switch is in MANUAL, the valve can be positioned using the OPEN/STOP/CLOSE selector switch.
* Valves will not be called to open in AUTO unless the respective SBR is in a decant step or a high-level condition has occurred.
* Valve failure will be alarmed if valve is not in the requested position within 120 seconds after valve is called to that position.
* In the event of an effluent valve failure, the SBR will remain in service and will continue to cycle through the treatment steps. This situation should be considered an emergency and the operator should correct the condition that caused the failure as quickly as possible. In order to avoid discharging partially treated wastewater, the operator should consider making manual adjustments to take a basin out of service if necessary.

⇒ SBR Suction Valves (qty. of 2)

* Suction Valve 1 (2-6-1) will allow the motive pump to draw from the ID/SC in SBR 1.
* Suction Valve 2 (2-6-2) will allow the motive pump to draw from the ID/SC in SBR 2.
* Valves can be controlled manually via the OPEN/CLOSE/AUTO selector switches on front of the control panel.
* Valves will not be called to close in automatic unless the respective SBR is in a Vacflush step.
* Valve failure will be alarmed if valve is not in the requested position within 120 seconds after valve is called to that position.

⇒ SBR Discharge Valves (qty. of 2)

* Discharge Valve 1 (2-7-1) will allow the motive pump to discharge to the jet headers in SBR 1.
* Discharge Valve 2 (2-7-2) will allow the motive pump to discharge to the jet headers in SBR 2.
* Valves can be controlled manually via the OPEN/CLOSE/AUTO selector switches on front of the control panel.
* Valves will not be called to close in automatic unless the respective SBR is in a Vacflush step.
* Valve failure will be alarmed if valve is not in the requested position within 120 seconds after valve is called to that position.

⇒ SBR Sludge Valves (qty. of 2)

* Sludge Valve 1 (2-11-1) will allow the motive pump to discharge to the Digester.

* Sludge Valve 2 (2-11-2) will allow the motive pump to discharge to the Digester.
* Valves can be controlled manually via the OPEN/CLOSE/AUTO selector switches on front of the control panel.
* Valves will not be called to close in automatic unless the respective SBR is in a Waste Sludge step.
* Valve failure will be alarmed if valve is not in the requested position within 120 seconds after valve is called to that position.

⇒ SBR Vacflush Suction Valves (qty. of 2)

* Vacflush Suction Valve 1 (2-8-1) will allow the motive pump to draw from the jet header in SBR 1.
* Vacflush Suction Valve 2 (2-8-2) will allow the motive pump to draw from the jet header in SBR 2.
* Valves can be controlled manually via the OPEN/CLOSE/AUTO selector switches on front of the control panel.
* Valves will not be called to open in automatic unless the respective SBR is in a Vacflush step.
* Valve failure will be alarmed if valve is not in the requested position within 120 seconds after valve is called to that position.

⇒ SBR Vacflush Discharge Valves (qty. of 2)

* Vacflush Discharge Valve 1 (2-9-1) will allow the motive pump to discharge to the ID/SC in SBR 1.
* Vacflush Discharge Valve 2 (2-9-2) will allow the motive pump to discharge to the ID/SC in SBR 2.
* Valves can be controlled manually via the OPEN/CLOSE/AUTO selector switches on front of the control panel.
* Valves will not be called to open in automatic unless the respective SBR is in a Vacflush step.
* Valve failure will be alarmed if valve is not in the requested position within 120 seconds after valve is called to that position.

⇒ Influent EQ Blowers (qty. of 2)

* Influent EQ Blower 1 (2-24-1) provides aeration to Influent EQ Basin 1.
* Influent EQ Blower 2 (2-24-2) provides aeration to Influent EQ Basin 2.
* Blowers can be controlled manually via the HAND/OFF/AUTO selector switches on front of the control panel.
* Blowers will only be called to run in AUTO when the respective Influent EQ Basin is in an Aeration step.
* If the Influent EQ Basin is in a high level condition, aeration to that tank will be suspended.
* Blower fail will be alarmed if blower run is not detected within 10 seconds of blower being called to run. If a blower failure occurs that blower will not be called to run in automatic again until the blower failure is reset. The blower failure is reset by placing the HOA switch into the OFF position then back to the AUTO position.
* Anti-cycle software timers prevent short cycling of blowers, set at 10 minutes from start to start.

⇒ Influent EQ Air Valves (qty. of 2)
  * Air Valve 1 (FV-2-25-1) will allow air from Influent EQ Blower 1 to be directed to Influent EQ Basin 1.
  * Air Valve 2 (FV-2-25-2) will allow air from Influent EQ Blower 2 to be directed to Influent EQ Basin 2.
  * Valves can be controlled manually via the OPEN/CLOSE/AUTO selector switches on front of the control panel.
  * Valves will always be called to open in AUTO.
  * Valve failure will be alarmed if valve is not in the requested position within 120 seconds after valve is called to that position.

⇒ Influent EQ Motive Pumps (qty. of 2)
  * Motive Pump 1 (P-2-36-1) provides mixing & transfer in Influent EQ Basin 1.
  * Motive Pump 2 (P-2-36-1) provides mixing & transfer in Influent EQ Basin 2.
  * Pumps can be controlled manually via the HAND/OFF/AUTO selector switches on front of the control panel.
  * Pumps will not be called to run in AUTO unless the respective Influent EQ Basin is in a mixing, aeration or transfer step.
  * If the Influent EQ Basin is in a high level condition, aeration/mixing in that tank will be suspended.
  * Pump fail will be alarmed if pump run is not detected within 5 seconds of pump being called to run.
  * In the event of a motive pump failure, the Influent EQ Basin will remain in service and will continue to cycle through the treatment steps. This situation should be considered an emergency and the operator should correct the condition that caused the failure as quickly as possible.
  * Anti-cycle software timers prevent short cycling of pumps, set at 10 minutes from start to start.

⇒ Influent EQ Isolation Valve (qty. of 1)
  * Influent EQ Isolation Valve (2-2-1) will allow raw influent from the screen to be directed to either the Influent EQ Basins or the SBRs.
  * Valve can be controlled manually via the OPEN/CLOSE/AUTO selector switch on front of the control panel.
  * Valve will not be called to open in automatic.

⇒ Influent EQ Influent Valves (qty. of 2)
  * Influent EQ 1 Influent Valve (2-26-1) will allow raw influent to be directed into Influent EQ Basin 1.
  * Influent EQ 2 Influent Valve (2-26-2) will allow raw influent to be directed into Influent EQ Basin 2.
  * Valves can be controlled manually via the OPEN/CLOSE/AUTO selector switches on front of the control panel.
  * Valves will not be called to open in automatic unless the respective Influent EQ Basin is selected to accept influent.
  * Valve failure will be alarmed if valve is not in the requested position within 120 seconds after valve is called to that position.

⇒ Influent EQ Suction Valves (qty. of 2)

* Influent EQ Suction Valve 1 (2-37-1) will allow the motive pump to draw from the ID/SC in Influent EQ Basin 1.
* Influent EQ Suction Valve 2 (2-37-2) will allow the motive pump to draw from the ID/SC in Influent EQ Basin 2.
* Valves can be controlled manually via the OPEN/CLOSE/AUTO selector switches on front of the control panel.
* Valves will not be called to close in automatic unless the respective Influent EQ Basin is in a Vacflush step.
* Valve failure will be alarmed if valve is not in the requested position within 120 seconds after valve is called to that position.

⇒ Influent EQ Discharge Valves (qty. of 2)

* Influent EQ Discharge Valve 1 (2-38-1) will allow the motive pump to discharge to the jet headers in Influent EQ Basin 1.
* Influent EQ Discharge Valve 2 (2-38-2) will allow the motive pump to discharge to the jet headers in Influent EQ Basin 2.
* Valves can be controlled manually via the OPEN/CLOSE/AUTO selector switches on front of the control panel.
* Valves will not be called to close in automatic unless the respective Influent EQ Basin is in a Vacflush step.
* Valve failure will be alarmed if valve is not in the requested position within 120 seconds after valve is called to that position.

⇒ Influent EQ Vacflush Suction Valves (qty. of 2)

* Influent EQ Vacflush Suction Valve 1 (2-39-1) will allow the motive pump to draw from the jet header in Influent EQ Basin 1.
* Vacflush Suction Valve 2 (2-39-2) will allow the motive pump to draw from the jet header in Influent EQ Basin 2.
* Valves can be controlled manually via the OPEN/CLOSE/AUTO selector switches on front of the control panel.
* Valves will not be called to open in automatic unless the respective Influent EQ Basin is in a Vacflush step.
* Valve failure will be alarmed if valve is not in the requested position within 120 seconds after valve is called to that position.

⇒ Influent EQ Vacflush Discharge Valves (qty. of 2)

* Influent EQ Vacflush Discharge Valve 1 (2-40-1) will allow the motive pump to discharge to the ID/SC in Influent EQ Basin 1.
* Influent EQ Vacflush Discharge Valve 2 (2-40-2) will allow the motive pump to discharge to the ID/SC in Influent EQ Basin 2.
* Valves can be controlled manually via the OPEN/CLOSE/AUTO selector switches on front of the control panel.
* Valves will not be called to open in automatic unless the respective Influent EQ Basin is in a Vacflush step.
* Valve failure will be alarmed if valve is not in the requested position within 120 seconds after valve is called to that position.

⇒ SBR Return Valves (qty. of 2)

* Influent EQ Return Valve 1 (2-41-1) will allow the motive pump to transfer to the SBR.

* Influent EQ Return Valve 2 (2-41-2) will allow the motive pump to transfer to the SBR.
* Valves can be controlled manually via the OPEN/CLOSE/AUTO selector switches on front of the control panel.
* Valves will not be called to open in automatic unless the respective Influent EQ Basin is in a Transfer step.
* Valve failure will be alarmed if valve is not in the requested position within 120 seconds after valve is called to that position.

⇒ Digester Blower (qty. of 1)

* Digester Blower (2-23-1) provides aeration to the Digester.
* Blowers can be controlled manually via the HAND/OFF/AUTO selector switches on front of the control panel.
* Blowers will only be called to run in AUTO when the Digester is in an aeration step.
* If the Digester is in a high level condition, aeration to that tank will be suspended.
* Blower fail will be alarmed if blower run is not detected within 10 seconds of blower being called to run.
* There is no blower to back up the digester blower. If a fail-to-run occurs, the operator should check the motor overloads and reset them if they have tripped.
* Anti-cycle software timers prevent short cycling of blowers, set at 10 minutes from start to start.

⇒ Alum Pumps (qty. of 2)

* Alum Pump 1 feeds alum to the influent piping between the Influent EQ Basins and the SBRs.
* Alum Pump 2 feeds alum to the waste sludge piping between the SBRs and the Digester.
* Alum Pump 1 will be called to run when either SBR is in a fill step.
* Alum Pump 2 will be called to run when either SBR is in a waste sludge step.

- Monitored Equipment

⇒ Auto/Manual Selector Switches (qty. of 3)

* System Auto/Manual Selector (HS-2-2-1) determines whether the entire SBR system is controlled automatically or manually.
* SBR 1 Auto/Manual Selector (HS-2-3-1-1) determines whether SBR 1 is in Automatic operation or Off.
* SBR 2 Auto/Manual Selector (HS-2-3-2-1) determines whether SBR 2 is in Automatic operation or Off.

⇒ High Level Float Switches (qty. of 4)

* SBR 1 High-Level Float Switch (LSH-2-15-1) will trigger a high-level condition in SBR 1.
* SBR 2 High-Level Float Switch (LSH-2-15-2) will trigger a high-level condition in SBR 2.
* SBR High-Level Floats are used to back up the SBR level transducers and to detect an emergency high-level condition in the SBR. If an emergency high-

level condition occurs, mixing and aeration will be suspended and the effluent valve will be opened in that SBR.

* Digester High-Level Float Switch (LSH-2-29-1) will trigger a high-level condition in the Digester. If this float is tripped aeration will be suspended in the digester.
* Pump Room Flood Switch (LSH-2-38-2) will alarm a flood condition in pump room.

⇒ Level Transducers (qty. of 5)

* Influent EQ Basin 1 Level Transducer (LIT-2-27-1) measures the liquid level in Influent EQ Basin 1.
* Influent EQ Basin 2 Level Transducer (LIT-2-27-2) measures the liquid level in Influent EQ Basin 2.
* SBR 1 Level Transducer (LIT-2-14-1) measures the liquid level in SBR 1.
* SBR 2 Level Transducer (LIT-2-14-2) measures the liquid level in SBR 2.
* Digester Level Transducer (LIT-2-28-1) measures the liquid level in the Digester.

⇒ Dissolved Oxygen Analyzers (qty. of 3)

* SBR 1 D.O. Analyzer (AIT-2-17-1) measures the D.O. level in SBR 1.
* SBR 2 D.O. Analyzer (AIT-2-17-2) measures the D.O. level in SBR 2.
* Digester D.O. Analyzer (AIT-2-30-1) measures the D.O. level in the Digester.

⇒ Flow Meters (qty. of 3)

* Plant Influent Flow Meter (FIT-2-1-1) measures the flow in to the plant.
* Effluent Flow Meter (FIT-2-13-1) measures the flow of effluent out of the SBRs.
* WAS Flow Meter (FIT-2-12-1) measures the flow of sludge wasted from the SBRs.

530 OPERATION

The SBRs will operate using the Slug Feed control strategy. In this mode there does not have to be an SBR in fill all the time, in fact most of the time there will not be an SBR in fill. When an SBR enters fill it will be filled from the Influent EQ basins in a short amount of time.

The control system only allows one SBR to be in Fill at a time. It will also only allow one SBR to be in Decant at a time. Other than that the SBRs will operate independently.

SLUG FEED OVERVIEW

SBR Operation

This selector allows the operator to select the state of the SBR from the selector switches on the front of the control panel. The operator can select the SBR to be in either Automatic or Manual. When the SBR is in Automatic, the control system will call all automatic valves to open or close and call all pumps and blowers to run or not run based on the current treatment step. When the SBR is in Manual, the control system will not call any valve to open or any pump or blower to run.

Tanks In/Out of Service

When putting an SBR into Automatic it is best (but not necessary) to have it at or below Bottom Water Level (BWL). When the SBR is put into Automatic, one of the following scenarios occur:

- If the tank level is less than 0.50 ft. above BWL, it will enter Idle.
- If the tank level is greater than 0.50 ft. above BWL, it will enter Settle.

Steps of Treatment

The SBR treatment steps are listed below. Not all of these steps occur during every batch. For example, when the Fill time ends before the Anoxic time ends there will be no Aerated Fill step. Step occurrence is dependent upon flow conditions and current setpoint values.

- Idle
- Aerated Idle
- Anoxic Static Fill
- Anoxic Mixed Fill
- Anoxic Static
- Anoxic Mixed
- Aerated Fill
- React
- Vacflush
- Settle
- Decant
- Waste Sludge

Alarms

When the SBR is in Automatic, the control system will monitor the position of the automatic valves to make sure they are in the required position. The control system will also monitor the run status of all pumps when they are called to run. When a valve is called to open or close it is given an ample amount of time to get to its required position. If the valve does not reach its required position as indicated by the valve limit switch, an alarm is generated by the control system. Likewise, if a pump is called to run but does not indicate a run condition, an alarm is generated by the control system.

When an alarm is generated, the control system will sound the alarm horn. The horn will continue to sound until the operator acknowledges the alarm, even if the alarm condition has gone away before it is acknowledged. The operator can acknowledge the alarm by pressing the horn silence pushbutton on the front of the control panel or by pressing the Alarm Acknowledge button on the SCADA screen.

540 SETPOINT DESCRIPTIONS

Anoxic/Fill Setpoints

Maximum Fill Time

The operator selects the maximum number of minutes the control system will allow for Anoxic Static Fill, Anoxic Mixed Fill, and Aerated Fill by adjusting the **Maximum Fill Time** setpoint. If the water level has not reached TWL before the **Maximum Fill Time** has expired, fill will be terminated and the tank will advance to the next treatment step.

Anoxic Time

The operator selects the number of minutes the control system will allow for the anoxic portion of the cycle (the time from the beginning of the cycle until Aeration begins). The anoxic portion of the cycle includes the Static Fill, Mixed Fill, Anoxic Static and Anoxic Mixed treatment steps.

Anoxic Static Percent

The operator has the ability to separate the anoxic portion of the cycle into static and mixed phases. The **Anoxic Static Percent** setpoint determines the percent of the anoxic time that will be static (no mixing). The remaining anoxic time will be mixed.

Aeration Setpoints

Overview to Aeration Setpoints/Operation

Once the anoxic time is complete, the SBR will enter aeration, which includes both Aerated Fill and React. An operator can shift aeration time into Aerated Fill by shortening the **Anoxic Time** setpoint to less than the **Maximum Fill Time** setpoint. The system calculates the required aeration time based on the level in the SBR and the aeration setpoints entered by the operator. Aerated Fill is the time remaining after completion of Anoxic time and will last until either the **Maximum Fill Time** expires or the level reaches Top Water Level (TWL). Once either of these two conditions has been met, the SBR enters React and remains in React until the required aeration time is complete.

Minimum/Maximum Aeration Time

The control system calculates the required aeration time based on the amount of fill in the SBR, the **Top** and **Bottom Water Level**, and the **Minimum** and **Maximum Aeration Time** setpoints. If the level in the SBR at the end of fill is at or below **Bottom Water Level**, the **Minimum Aeration Time** setpoint will be used for the required aeration time. If the level in the SBR at the end of fill is at or above **Top Water Level**, the **Maximum Aeration Time** setpoint will be used for the required aeration time. If the level in the SBR at the end of fill is between **Bottom Water Level** and **Top Water Level**, the required aeration time will be calculated linearly between **Minimum** and **Maximum Aeration Time** proportional to the amount of fill between **Bottom** and **Top Water Level**.

Example: Assume **Bottom** and **Top Water Level** are set at 14.00 feet and 16.00 feet respectively, and **Minimum** and **Maximum Aeration Time** are set at 120 and 180 minutes respectively. If the tank is filled to 15.50 feet (75% of a full batch) the required aeration time will be calculated in the following manner:

Max. Aeration - Min. Aeration: 180 - 120 = 60 minutes

75% of 60 minutes = 45 minutes

120 + 45 = 165 minutes of aeration

Minimum React

This setpoint ensures a minimum amount of react each cycle, regardless of the calculated aeration time. The control system will make sure the React step is not less than the **Minimum React** setpoint.

Blower On/Off Duration

The control system allows the operator to cycle the blower on and off during aeration to achieve de-nitrification, conserve power, or to try to eliminate over-aerating. When aeration starts, the blower will be called to run utilizing the D.O. setpoints for the **Air On Time** setpoint. During the on time, the blower will cycle on if the D.O. is below the **D.O. Air On** setpoint and will cycle off if the D.O. is above the **D.O. Air Off** setpoint. Once the **Air On Time** expires, the air will turn off and stay off for the **Air Off Time** setpoint, ignoring the D.O. and D.O. setpoints. The air will continue to cycle on and off throughout the duration of aeration. If the operator wants the air to cycle on/off continually utilizing the D.O. throughout aeration, the **Air Off Time** setpoint should be set to zero.

Dissolved Oxygen Terminate Option

If this option is enabled, the control system will compare the D.O. level in the SBR to the **Terminate Aeration** setpoint and terminate aeration if the D.O. level exceeds it. The aeration will not be allowed to terminate early unless the **Minimum Aeration Time** setpoint (see above) has been exceeded. The aerating tank must also be in React. If this option is disabled, the control system will ignore the D.O. level and the length of aeration will be based on the calculated airtime.

Vacflush Time

The **Vacflush Time** setpoint gives the operator the ability to set the duration of vacflush. If the setpoint is set to zero, no vacflush will occur. The control system will vacflush daily, the first available time (end of aeration) after the **Time of Day** setpoint. This **Time of Day** setpoint is shared by the waste sludge step and appears under the waste sludge setpoints.

Settle Setpoints

The **Settle Prep** setpoint allows the operator to adjust the amount of time the SBR motive pump will run after aeration is complete. This is done to enhance the settlability in the SBR.

The **Settle Time** setpoint allows the operator to adjust the duration of the settle step. The time that the operator has entered into the **Settle** setpoint begins at the beginning of Settle Prep. The actual settle prep duration falls within the settle step. For example, if the operator enters a five minute settle prep and a 45 minute settle, the motive pumps will run for the first five minutes of settle and will be off for the remaining 40 minutes (45 - 5).

Decant Setpoints

Decant is not by design, a timed treatment step. When an SBR tank enters decant, the control system will monitor the water level in the tank. When the water level reaches the **Bottom Water Level (BWL)** setpoint, decant is terminated. The **Maximum Decant** setpoint is designed as an emergency backup. If **BWL** is not reached within the time the operator has determined reasonable, the control system will alarm this condition and continue with the next treatment step. Be careful to not set this setpoint too low. If decant is continually shortened, smaller batches will occur and a problem can be compounded under high flow conditions.

The **Target Effluent Flow Rate** setpoint is entered in gpm, and represents the target flow rate desired during decant. The control system compares the calculated effluent flow rate based on level changes in the SBR to this setpoint and modulates the open/closed position of the effluent valve of the decanting SBR in order to achieve the desired flow rate.

Sludge Wasting Setpoints

Wasting Sludge Time and Waste Sludge Volume

The operator can enter setpoints for the number of minutes (**Waste Sludge Time**) and the volume (**Waste Sludge Volume**) to waste sludge from each SBR. Individual setpoints are provided for each tank, allowing the operator the flexibility to select different waste sludge times and volumes. Both the time and volume setpoint will always be utilized. If the operator wants to waste by volume, the time setpoint must be high enough that the wasting can occur before the time setpoint is exceeded. This protects against a failed flow meter situation. Likewise, if the operator wants to waste by time, the operator must set the volume setpoint high enough that the wasting time can occur before the volume setpoint is exceeded. If either the **Waste Sludge Time** or the **Waste Sludge Volume** setpoint is set to zero, sludge wasting will not occur.

Wasting Frequency

The **Waste Sludge Frequency** setpoint gives the operator the flexibility of choosing to waste sludge one time per day or each SBR cycle. If one time a day has been selected, the control system will waste sludge the first available idle time after the **Waste Sludge Time-of-Day** setpoint. If the operator has selected to waste sludge each cycle, every time an SBR reaches Idle, the control system will waste sludge. A high level condition in the digester will discontinue sludge wasting until the high level condition clears.

Idle Setpoints

Maximum Idle Time

Once the SBR cycle is complete it will remain in Idle until the next cycle begins. The next SBR cycle will start when the **Maximum Idle Time** has expired or the level in the Influent Equalization Basin reaches the **Initiate Fill Level**.

Idle/Aerated Idle Time

During long periods of Idle the operator may wish to periodically aerate the SBR to prevent it from going septic. Once the SBR is in Idle the control system will wait for the **Idle Time** setpoint to expire, and then it will turn on the motive pump and blower to aerate the SBR. The control system will continue to aerate the SBR until the **Aerated Idle Time** setpoint has expired, and then it will turn off the motive pump and blower. If the SBR remains in Idle long enough for the **Idle Time** setpoint to expire again another Aerated Idle step will occur.

SBR Level Setpoints

Top Water Level (TWL)

The control system allows the operator to enter a **Top Water Level** setpoint, which represents a full batch. While an SBR is in a fill step, the control system monitors the **Maximum Fill Time** setpoint. If the SBR level reaches **TWL** before the fill time is complete, the control system will terminate fill and advance to the next step.

Bottom Water Level (BWL)

The control system uses the **Bottom Water Level** setpoint during decant and at the initial startup of an SBR. Once an SBR enters a decant step, the control system monitors the water level and exits the decant step when the water level reaches the **BWL** setpoint. When a tank is placed into auto, the control system will check the current level against the **BWL** setpoint (Refer to "SBR Operation" above for a full description).

Equalization Tank Setpoints

The operation of the Influent EQ Motive Pumps is controlled by tank level sensors. There is a high level setpoint that initiates fill to the SBRs. There is also a higher level setpoint that terminates a React Phase to force the SBR into a Settle Phase. The low cutoff level in the Equalization Basin must be set no lower than 6 feet to keep the gravity pipeline to the screening building full of water. Having this pipeline full is required to allow the influent flow meter to function properly.

High Alarm Level
If the level in the equalization tank rises above the **High Alarm Level** setpoint, a high-level alarm will be generated.

Terminate React Level
If the level in the equalization tank rises above the **Terminate React Level** setpoint, this indicates that the treatment plant is experiencing extremely high flow conditions and the SBR process needs to be speeded up to accommodate the extra flow. In this situation, if there is not already an SBR in Settle, Decant or Idle, then the SBR that has been in React the longest will be forced to advance to Settle.

Initiate Fill Level
If the level in the equalization tank rises above the **Initiate Fill Level** setpoint, this indicates that the treatment plant is experiencing higher than normal flow conditions and the SBR process needs to be speeded up to accommodate the extra flow. In this situation, Idle will be skipped and a new treatment cycle will be initiated.

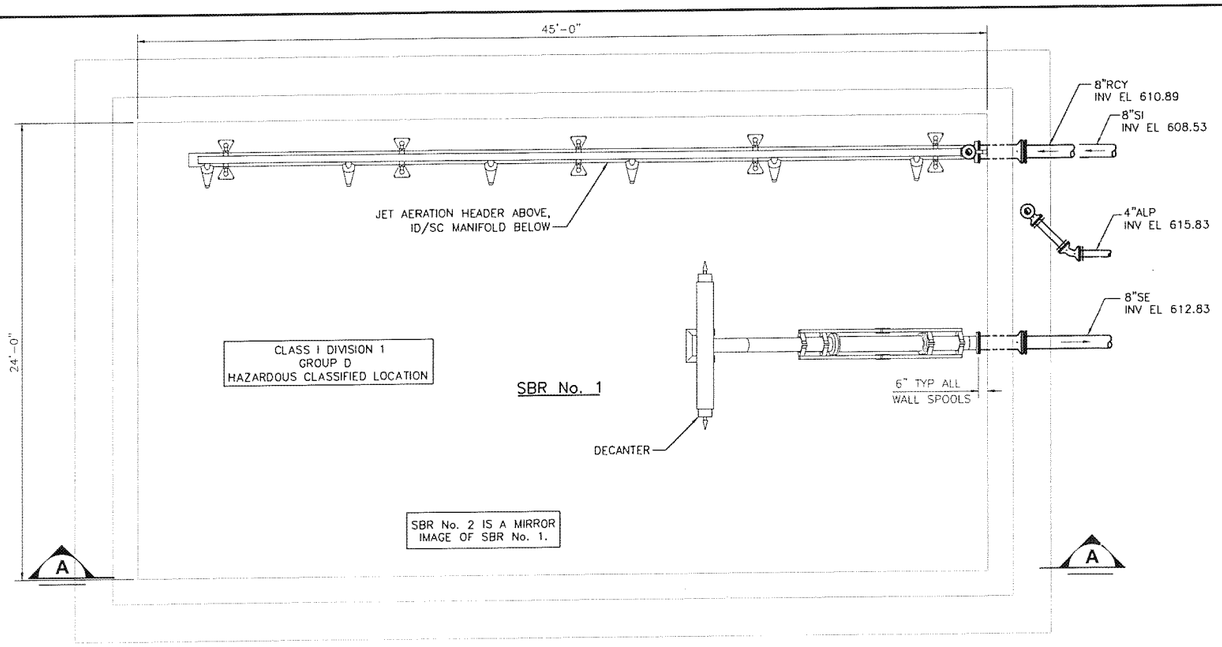
Fill Cutoff Level
If the level in the equalization tank drops below the **Fill Cutoff Level** setpoint, this signals that the Equalization Tank is almost empty and fill to the SBR will be terminated.

Low Alarm Level
If the level in the equalization tank drops below the **Low Alarm Level** setpoint, a low-level alarm will be generated.

Anoxic Static/Anoxic Mixed/Aeration Duration
The Influent EQ Basins will sequence through three steps - Anoxic Static (no mixing, no air), Anoxic Mixed (mixing but no air), and Aeration (mixing and air). These setpoints determine the duration of each of these steps. Once Aeration is completed the basins will return to Anoxic Static. Both basins will be in the same step unless one of them is taken out of service for maintenance. The Aeration step will end when either SBR is in fill.

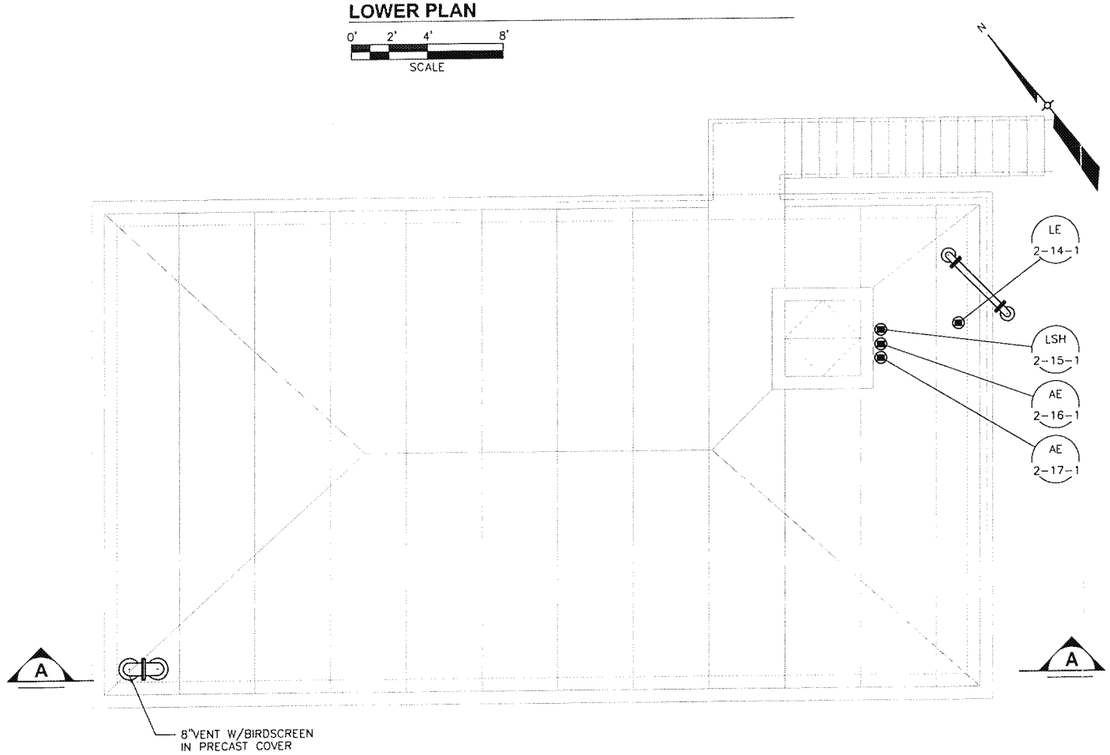
Vacflush Duration
The Influent EQ Basins will go through a Vacflush step once per day. During this step flow through the jet headers will be reversed to remove accumulation in the jets. The **Vacflush Duration** setpoint determines the number of minutes of Vacflush.

550 SCADA SCREENS



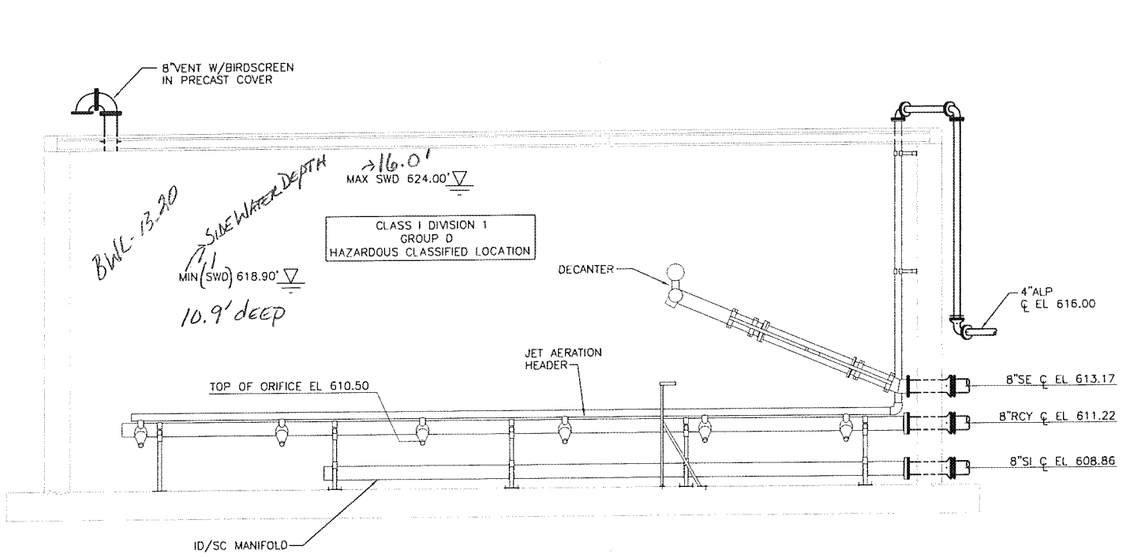
LOWER PLAN

0' 2' 4' 8'
SCALE



UPPER PLAN

0' 2' 4' 8'
SCALE



SECTION A

0' 2' 4' 8'
SCALE

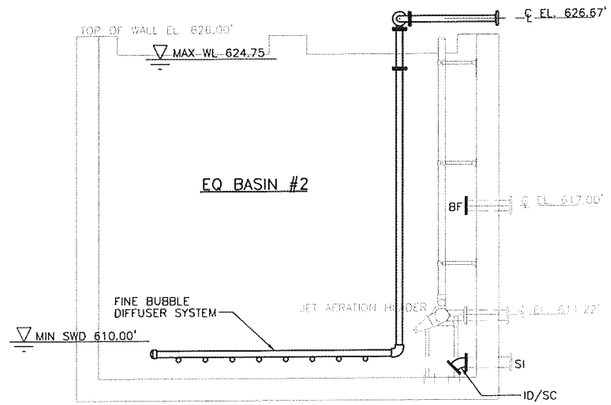
EARTH TECH

4135 Technology Parkway • Sheboygan, WI 53083-1883 • (920) 458-8711

FIGURE
SBR

BAD RIVER BAND ODANAH COMMUNITY WWTP

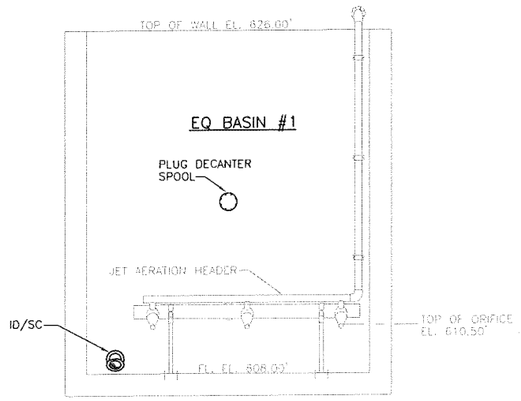
File: L:\WORK\44037\CADD\onm figures\30ME1.dwg Time: Apr 22, 2002 - 1:41pm



SECTION A

0' 2' 4' 8'

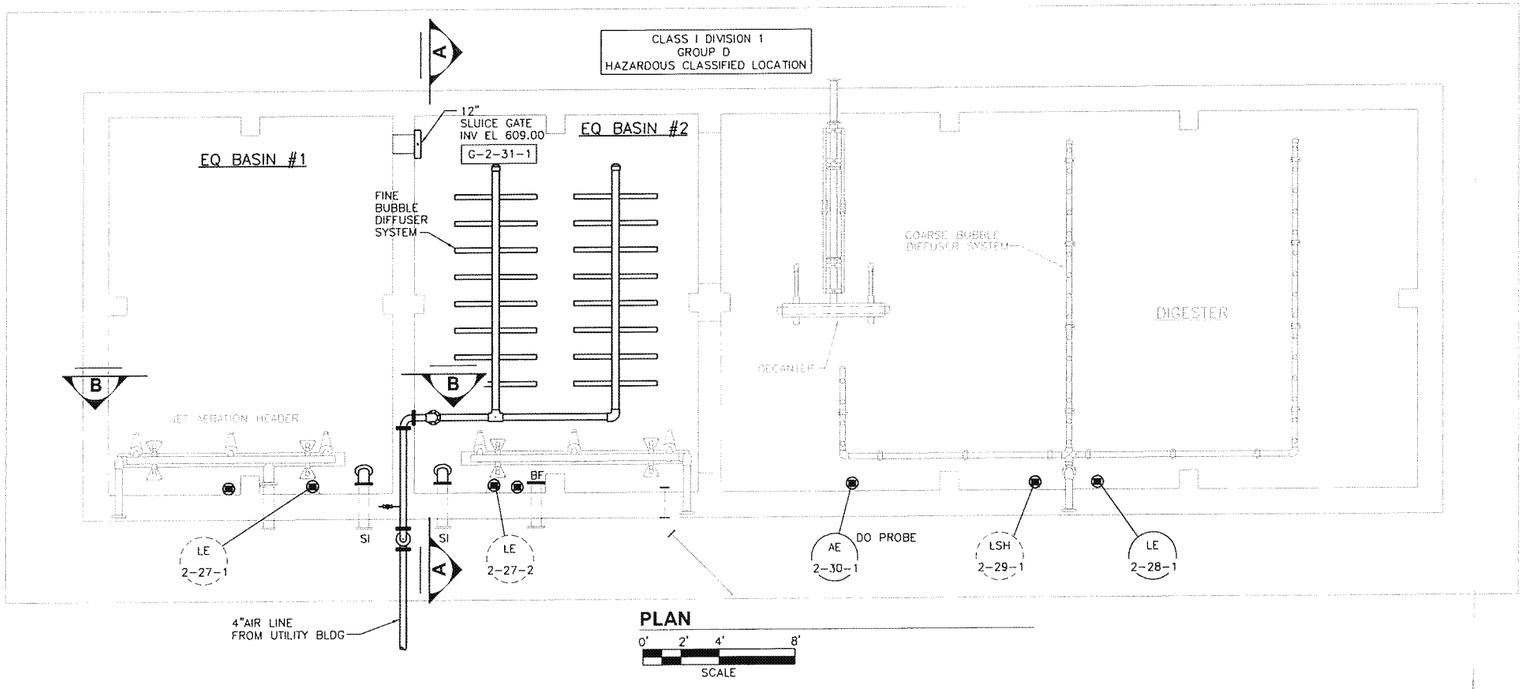
SCALE



SECTION B

0' 2' 4' 8'

SCALE



PLAN

0' 2' 4' 8'

SCALE

N

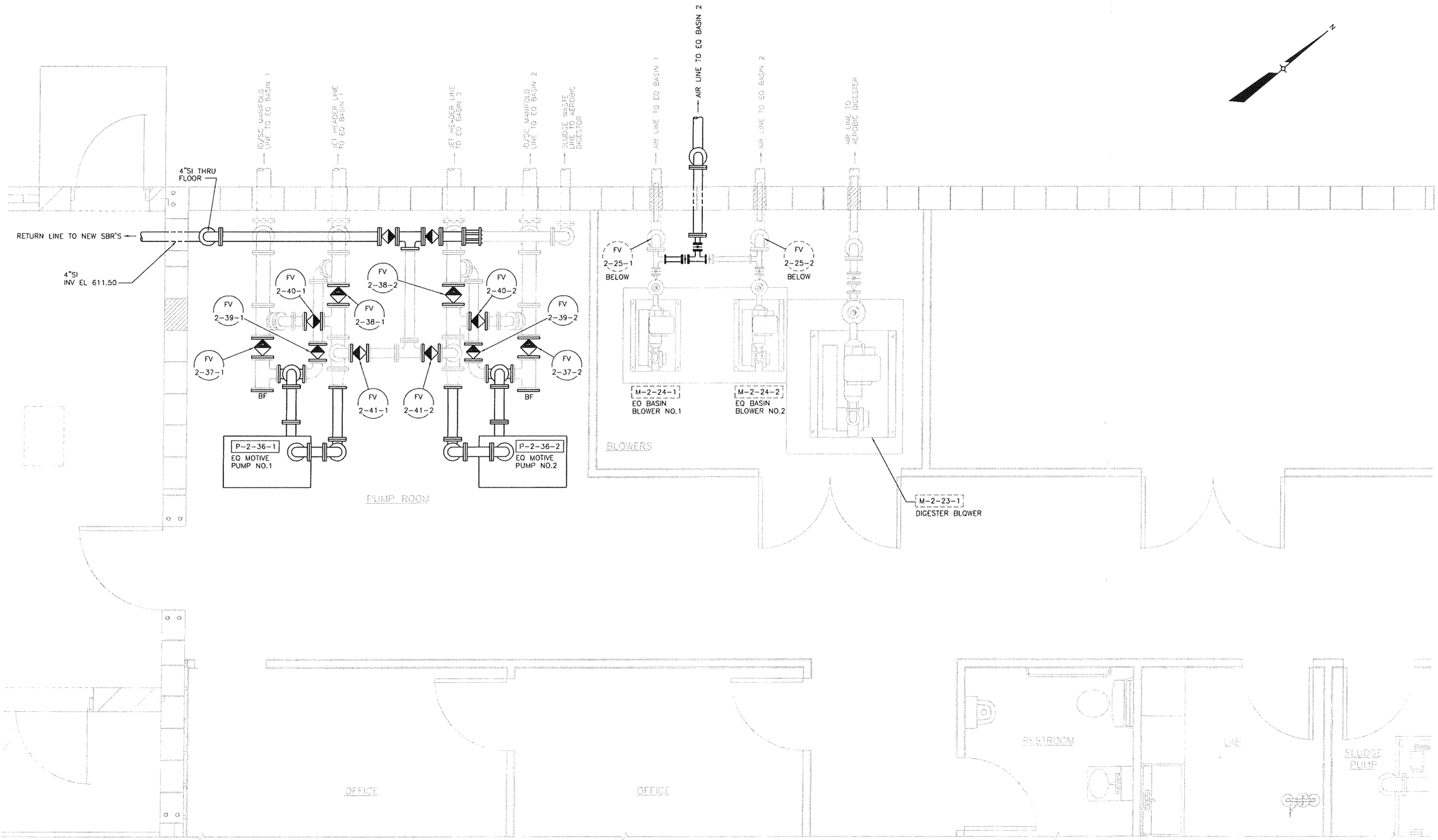
EARTH TECH

4135 Technology Parkway • Sheboygan, WI. 53083-1883 • (920) 458-8711

FIGURE
EQ BASINS AND DIGESTER

BAD RIVER BAND ODANAH COMMUNITY WWTP

File: L:\WORK\44037\CADD\anm figures\20ME1.dwg Time: Apr 26, 2002 - 12:53pm



PARTIAL PLAN

0' 2' 4'
SCALE

E A R T H T E C H

4135 Technology Parkway • Sheboygan, WI. 53083-1883 • (920) 458-8711

FIGURE
UTILITY BUILDING

BAD RIVER BAND ODANAH COMMUNITY WWTP

File: L:\WORK\44037\CADD\onm figures\40M1.dwg Time: Apr 26, 2002 - 12:52pm


Bad River Indian Tribe WWTP - C:\WWTS\BADRIVER\WWTP
File Logic Special
Development!
INTEGRATED CONTROLS
June 24, 2015
Node Name: BR1
Operator
operator
Level
9000
Log On
Log Off
Legend
Site Overview
Influent EQ/Digester
SBR Overview
Operator Setpoints
Effluent Pump Station
SBR1 Trends
SBR2 Trends
Other Trends
Data Extraction
MLSS/SRT Calculations
Run Times/Flow Totals
N.O. LS1
N.O. LS2
N.O. LS3
Well House
Dprville LS
Dprville Tank
F.F. LS
F.F. WH
Emerg. Gen.
B.H. WH
System Configuration
Waste Water Treatment Plant
Diaperville Lift Station
Odanah
Diaperville Hydropneumatic Tank
New Odanah Lift Station No.1
New Odanah Lift Station No.2
New Odanah Well House and Tower
New Odanah Lift Station No.3
Franksfield Well House & Tower
Franksfield Lift Station
Birch Hill Well House & Tower
Alarms & Events
Alarm Database
Alarm Dialer
Alarm Acknowledge
Influent
Effluent
Air
Sludge
Alum
NPW
RAS

Four Methods of Filling the Tanks

There are 4 methods for operating the SBRs with and without the Equalization Basins. The step-by-step procedures for these 4 methods are discussed in *Section 530 Operations*. The 4 methods are:

1) SBR ~~CONSTANT~~ NORMAL FILL MODE. The two SBRs alternate being filled. The Equalization Basins are not used. Each SBR has a 6-hour sequence. SBR #1 is FILLED during a 3-hour period. The second 3-hour period is for REACT, SETTLE, DECANT, AND IDLE/WASTE. SBR #2's 3-hour FILL stage begins immediately after SBR #1's FILL stage.

USE IF HIGH ORGANIC FLOWS & HARDLY ANY AT NITE.

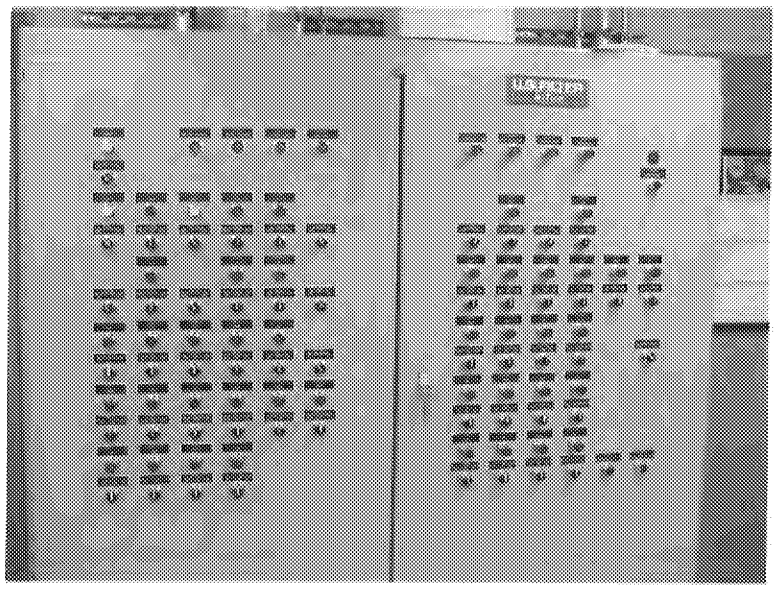
2) SIDESTREAM EQUALIZATION MODE. Both SBRs and both Equalization basins are used. The Equalization basins receive a portion of the flow during the day during heavy daytime organic loadings, and return the loadings to the SBRs at night. Equalization basin #1 is devoted to SBR #1, and Equalization basin #2 is devoted to SBR #2. The SBRs have a 6-hour sequence as described in 1) above, but for a portion of the daytime 3 hour FILL stages, flow stops going to the SBR and goes to the Equalization basin. At night, during the 3-hour FILL stages, some of the liquid in the Equalization basin is pumped to the SBR.

3) GREASE REMOVAL MODE. All influent flow is pumped to Equalization basin #2. Influent flows from Equalization basin #2 to Equalization basin #1, and is pumped to the SBRs. Liquid level in the EQ Basins is maintained at high level. Influent grease is trapped in Equalization basin #2 and fine bubble aeration causes the grease to float, overflowing the common wall to the Aerobic Digester.

4) INLINE EQUALIZATION MODE. All influent flow is pumped to Equalization basin #2. Influent flows from Equalization basin #2 to Equalization basin #1, and is pumped to the SBRs. The SBR sequence is 9 hours. Levels in the Equalization basins rise and fall.

520 SBR CONTROLS

The SBR System is controlled from the two personnel computers (Operations PC and Utility Manager PC) and the SBR Control Panel, 40-LCP-2-1. Operational setpoints are made through the PC.



The table below presents a list of the control panel devices. Attached are diagrams of the system that show schematics of the tanks, air and liquid pipes, valves, pumps/blowers, and instruments attached to the pipes and tanks. These diagrams provide a convenient way to view the systems and its various components and instrumentation. The attached diagrams include:

- Diagram-SBR
- Diagram-SBR Blowers
- Diagram-Equalization Basins & Digester
- Diagram-Equalization Basin & Digester Pumping

Viewing these diagrams with the control panel devices and the other attached figures that show the site layout will help to understand the system operation presented in *Section 530 Operations.*

SBR Control Panel 40-LCP-2-1 Control Devices	
PLC	Allen Bradley 5/05 PLC
HS-2-1-1	System MANUAL-AUTO switch
HS-2-3-1-1	SBR #1 MANUAL-AUTO switch
HS-2-3-1-2	SBR #2 MANUAL-AUTO switch
HS-2-32-1	EQ Basin #1 MANUAL-SIDESTREAM-GREASE-INLINE
HS-2-32-2	EQBasin #2 MANUAL-SIDESTREAM-GREASE-INLINE
HS-2-20-1	SBR Blower ON, TIME/ORP MODE switch
HS-2-20-2	SBR Blower OFF, TIME/ORP MODE switch
HS-2-23-1	Digester Blower TIME/DO MODE switch
HS-2-12-1	WAS TIME/FLOW MODE switch
HS-2-18-1-1	SBR Blower #1 HAND-OFF-AUTO switch
HS-2-18-2-1	SBR Blower #2 HAND-OFF-AUTO switch

DIVISION 500

SEQUENCING BATCH REACTOR SYSTEM

DIVISION 500

Sequencing Batch Reactor System

510 OVERVIEW

The Sequencing Batch Reactor (SBR) is a fill and draw activated sludge treatment process that operates in batch mode. The SBR treatment cycle consists of a timed sequence that includes the following steps: FILL, REACT, SETTLE, DECANT, SLUDGE WASTING and IDLE – all in the same tank.

SBR operation is flexible and can provide secondary treatment, nitrification, denitrification, and biological nutrient removal by adjustment of the timed sequence.

The Odanah Community SBR system includes two Influent Equalization Basins that were converted from previous SBR tanks. The two SBR tanks and the two Influent EQ Basins are designed to operate together. Raw influent will be directed to one of the Influent EQ Basins and will be allowed to flow between the basins through a gate in the wall between the two. Raw influent will be stored in the Influent EQ Basins until an SBR is ready to receive influent, at which point it will be transferred rapidly to one of the SBRs.

Influent EQ Motive Pumps provide mixing in the Influent EQ Basins and transfer influent to the SBRs. Raw influent can enter either Influent EQ Basin, and either Influent EQ Basin can transfer to either SBR. The system will alternate between sending raw influent first to one then the other Influent EQ Basin. Whichever basin is receiving influent, the other basin is designated to transfer to the SBRs.

The SBRs will alternate receiving influent. Each batch of influent is treated and clarified before being discharged. The SBRs will operate using the Slug Feed control strategy. In this mode there does not have to be an SBR in fill all the time, in fact most of the time there will not be an SBR in fill. When an SBR enters fill a batch will be transferred from the Influent EQ basins in a short amount of time.

The control system only allows one SBR to be in Fill at a time. It will also only allow one SBR to be in Decant at a time. Other than that the SBRs will operate independently.

HOW THE INFLUENT EQ BASINS WORK

At any given time, one Influent EQ Basin is selected to receive influent flow and the other basin is selected to transfer to the SBRs. Fill and Transfer designation will be alternated between the basins after each transfer to the SBRs.

Each Influent EQ Basin can independently go through the following steps:

- ANOXIC STATIC – No mixing or aeration will take place in the basin. The basin will remain in this step until the **Anoxic Static Time** setpoint has expired, at which point it will proceed to Anoxic Mixed.

The table below presents a list of the control panel devices. Attached are diagrams of the system that show schematics of the tanks, air and liquid pipes, valves, pumps/blowers, and instruments attached to the pipes and tanks. These diagrams provide a convenient way to view the systems and its various components and instrumentation. The attached diagrams include:

- Diagram-SBR
- Diagram-SBR Blowers
- Diagram-Equalization Basins & Digester
- Diagram-Equalization Basin & Digester Pumping

Viewing these diagrams with the control panel devices and the other attached figures that show the site layout will help to understand the system operation presented in *Section 530 Operations.*

SBR Control Panel 40-LCP-2-1 Control Devices	
PLC	Allen Bradley 5/05 PLC
HS-2-1-1	System MANUAL-AUTO switch
HS-2-3-1-1	SBR #1 MANUAL-AUTO switch
HS-2-3-1-2	SBR #2 MANUAL-AUTO switch
HS-2-32-1	EQ Basin #1 MANUAL-SIDESTREAM-GREASE-INLINE
HS-2-32-2	EQBasin #2 MANUAL-SIDESTREAM-GREASE-INLINE
HS-2-20-1	SBR Blower ON, TIME/ORP MODE switch
HS-2-20-2	SBR Blower OFF, TIME/ORP MODE switch
HS-2-23-1	Digester Blower TIME/DO MODE switch
HS-2-12-1	WAS TIME/FLOW MODE switch
HS-2-18-1-1	SBR Blower #1 HAND-OFF-AUTO switch
HS-2-18-2-1	SBR Blower #2 HAND-OFF-AUTO switch
HS-2-18-3-1	SBR Blower #3 HAND-OFF-AUTO switch
HS-2-24-1	EQBasin Blower #1 HAND-OFF-AUTO switch
HS-2-24-2	EQBasin Blower #2 HAND-OFF-AUTO switch
HS-2-23-1	Digester Blower HAND-OFF-AUTO switch
HS-2-5-1-2	SBR #1 Motive Pump HAND-OFF-AUTO switch
HS-2-5-2-2	SBR #2 Motive Pump HAND-OFF-AUTO switch
HS-2-36-1-2	EQBasin #1 Motive Pump HAND-OFF-AUTO switch
HS-2-36-2-2	EQBasin #2 Motive Pump HAND-OFF-AUTO switch
HS-2-4-1-1	SBR #1 Inlet Valve OPEN-CLOSE-AUTO switch
HS-2-4-2-1	SBR #2 Inlet Valve OPEN-CLOSE-AUTO switch
HS-2-26-1-1	EQBasin #1 Inlet Valve OPEN-CLOSE-AUTO switch
HS-2-26-2-1	EQBasin #2 Inlet Valve OPEN-CLOSE-AUTO switch
HS-2-2-1	EQ Isolation Valve OPEN-CLOSE AUTO switch
FIC-2-10-1	SBR Effluent Decant Flow PID Loop Controller
HS-2-10-1-1	SBR #1 Effluent Valve OPEN-CLOSE-AUTO switch
HS-2-10-2-1	SBR #2 Effluent Valve OPEN-CLOSE-AUTO switch
HS-2-19-1	Blower 1/3 Isolation Valve OPEN-CLOSE-AUTO switch

The table below presents a list of the control panel devices. Attached are diagrams of the system that show schematics of the tanks, air and liquid pipes, valves, pumps/blowers, and instruments attached to the pipes and tanks. These diagrams provide a convenient way to view the systems and its various components and instrumentation. The attached diagrams include:

- Diagram-SBR
- Diagram-SBR Blowers
- Diagram-Equalization Basins & Digester
- Diagram-Equalization Basin & Digester Pumping

Viewing these diagrams with the control panel devices and the other attached figures that show the site layout will help to understand the system operation presented in *Section 530 Operations.*

SBR Control Panel 40-LCP-2-1 Control Devices	
PLC	Allen Bradley 5/05 PLC
HS-2-1-1	System MANUAL-AUTO switch
HS-2-3-1-1	SBR #1 MANUAL-AUTO switch
HS-2-3-1-2	SBR #2 MANUAL-AUTO switch
HS-2-32-1	EQ Basin #1 MANUAL-SIDESTREAM-GREASE-INLINE
HS-2-32-2	EQBasin #2 MANUAL-SIDESTREAM-GREASE-INLINE
HS-2-20-1	SBR Blower ON, TIME/ORP MODE switch
HS-2-20-2	SBR Blower OFF, TIME/ORP MODE switch
HS-2-23-1	Digester Blower TIME/DO MODE switch
HS-2-12-1	WAS TIME/FLOW MODE switch
HS-2-18-1-1	SBR Blower #1 HAND-OFF-AUTO switch
HS-2-18-2-1	SBR Blower #2 HAND-OFF-AUTO switch
HS-2-18-3-1	SBR Blower #3 HAND-OFF-AUTO switch
HS-2-24-1	EQBasin Blower #1 HAND-OFF-AUTO switch
HS-2-24-2	EQBasin Blower #2 HAND-OFF-AUTO switch
HS-2-23-1	Digester Blower HAND-OFF-AUTO switch
HS-2-5-1-2	SBR #1 Motive Pump HAND-OFF-AUTO switch
HS-2-5-2-2	SBR #2 Motive Pump HAND-OFF-AUTO switch
HS-2-36-1-2	EQBasin #1 Motive Pump HAND-OFF-AUTO switch
HS-2-36-2-2	EQBasin #2 Motive Pump HAND-OFF-AUTO switch
HS-2-4-1-1	SBR #1 Inlet Valve OPEN-CLOSE-AUTO switch
HS-2-4-2-1	SBR #2 Inlet Valve OPEN-CLOSE-AUTO switch
HS-2-26-1-1	EQBasin #1 Inlet Valve OPEN-CLOSE-AUTO switch
HS-2-26-2-1	EQBasin #2 Inlet Valve OPEN-CLOSE-AUTO switch
HS-2-2-1	EQ Isolation Valve OPEN-CLOSE AUTO switch
FIC-2-10-1	SBR Effluent Decant Flow PID Loop Controller
HS-2-10-1-1	SBR #1 Effluent Valve OPEN-CLOSE-AUTO switch
HS-2-10-2-1	SBR #2 Effluent Valve OPEN-CLOSE-AUTO switch
HS-2-19-1	Blower 1/3 Isolation Valve OPEN-CLOSE-AUTO switch

The table below presents a list of the control panel devices. Attached are diagrams of the system that show schematics of the tanks, air and liquid pipes, valves, pumps/blowers, and instruments attached to the pipes and tanks. These diagrams provide a convenient way to view the systems and its various components and instrumentation. The attached diagrams include:

- Diagram-SBR
- Diagram-SBR Blowers
- Diagram-Equalization Basins & Digester
- Diagram-Equalization Basin & Digester Pumping

Viewing these diagrams with the control panel devices and the other attached figures that show the site layout will help to understand the system operation presented in *Section 530 Operations*.

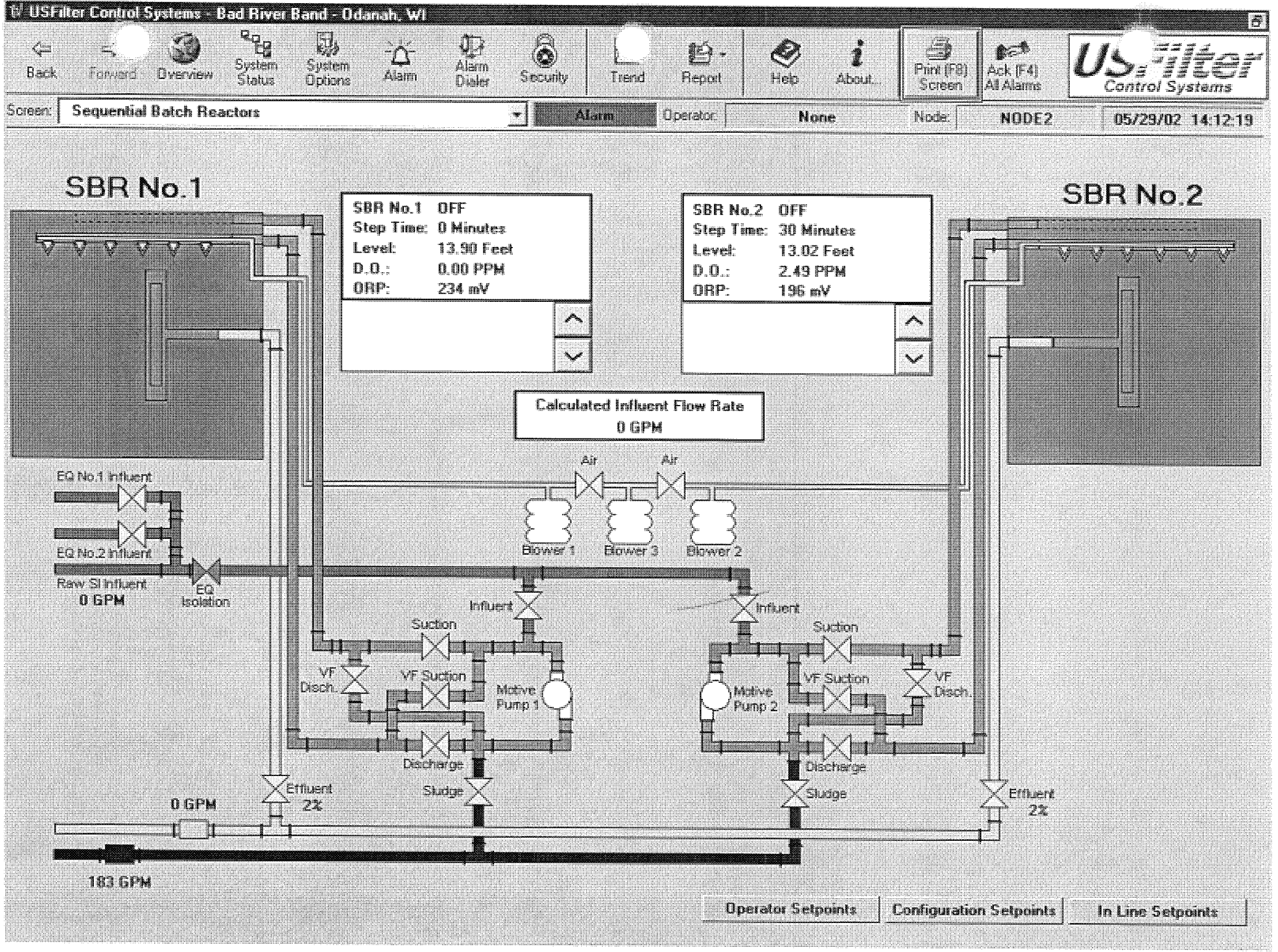
SBR Control Panel 40-LCP-2-1 Control Devices	
PLC	Allen Bradley 5/05 PLC
HS-2-1-1	System MANUAL-AUTO switch
HS-2-3-1-1	SBR #1 MANUAL-AUTO switch
HS-2-3-1-2	SBR #2 MANUAL-AUTO switch
HS-2-32-1	EQ Basin #1 MANUAL/SIDESTREAM-GREASE-INLINE
HS-2-32-2	EQBasin #2 MANUAL-SIDESTREAM-GREASE-INLINE
HS-2-20-1	SBR Blower ON, TIME/ORP MODE switch
HS-2-20-2	SBR Blower OFF, TIME/ORP MODE switch
HS-2-23-1	Digester Blower TIME/DO MODE switch
HS-2-12-1	WAS TIME/FLOW MODE switch
HS-2-18-1-1	SBR Blower #1 HAND-OFF-AUTO switch
HS-2-18-2-1	SBR Blower #2 HAND-OFF-AUTO switch
HS-2-18-3-1	SBR Blower #3 HAND-OFF-AUTO switch
HS-2-24-1	EQBasin Blower #1 HAND-OFF-AUTO switch
HS-2-24-2	EQBasin Blower #2 HAND-OFF-AUTO switch
HS-2-23-1	Digester Blower HAND-OFF-AUTO switch
HS-2-5-1-2	SBR #1 Motive Pump HAND-OFF-AUTO switch
HS-2-5-2-2	SBR #2 Motive Pump HAND-OFF-AUTO switch
HS-2-36-1-2	EQBasin #1 Motive Pump HAND-OFF-AUTO switch
HS-2-36-2-2	EQBasin #2 Motive Pump HAND-OFF-AUTO switch
HS-2-4-1-1	SBR #1 Inlet Valve OPEN-CLOSE-AUTO switch
HS-2-4-2-1	SBR #2 Inlet Valve OPEN-CLOSE-AUTO switch
HS-2-26-1-1	EQBasin #1 Inlet Valve OPEN-CLOSE-AUTO switch
HS-2-26-2-1	EQBasin #2 Inlet Valve OPEN-CLOSE-AUTO switch
HS-2-2-1	EQ Isolation Valve OPEN-CLOSE AUTO switch
FIC-2-10-1	SBR Effluent Decant Flow PID Loop Controller
HS-2-10-1-1	SBR #1 Effluent Valve OPEN-CLOSE-AUTO switch
HS-2-10-2-1	SBR #2 Effluent Valve OPEN-CLOSE-AUTO switch
HS-2-19-1	Blower 1/3 Isolation Valve OPEN-CLOSE-AUTO switch

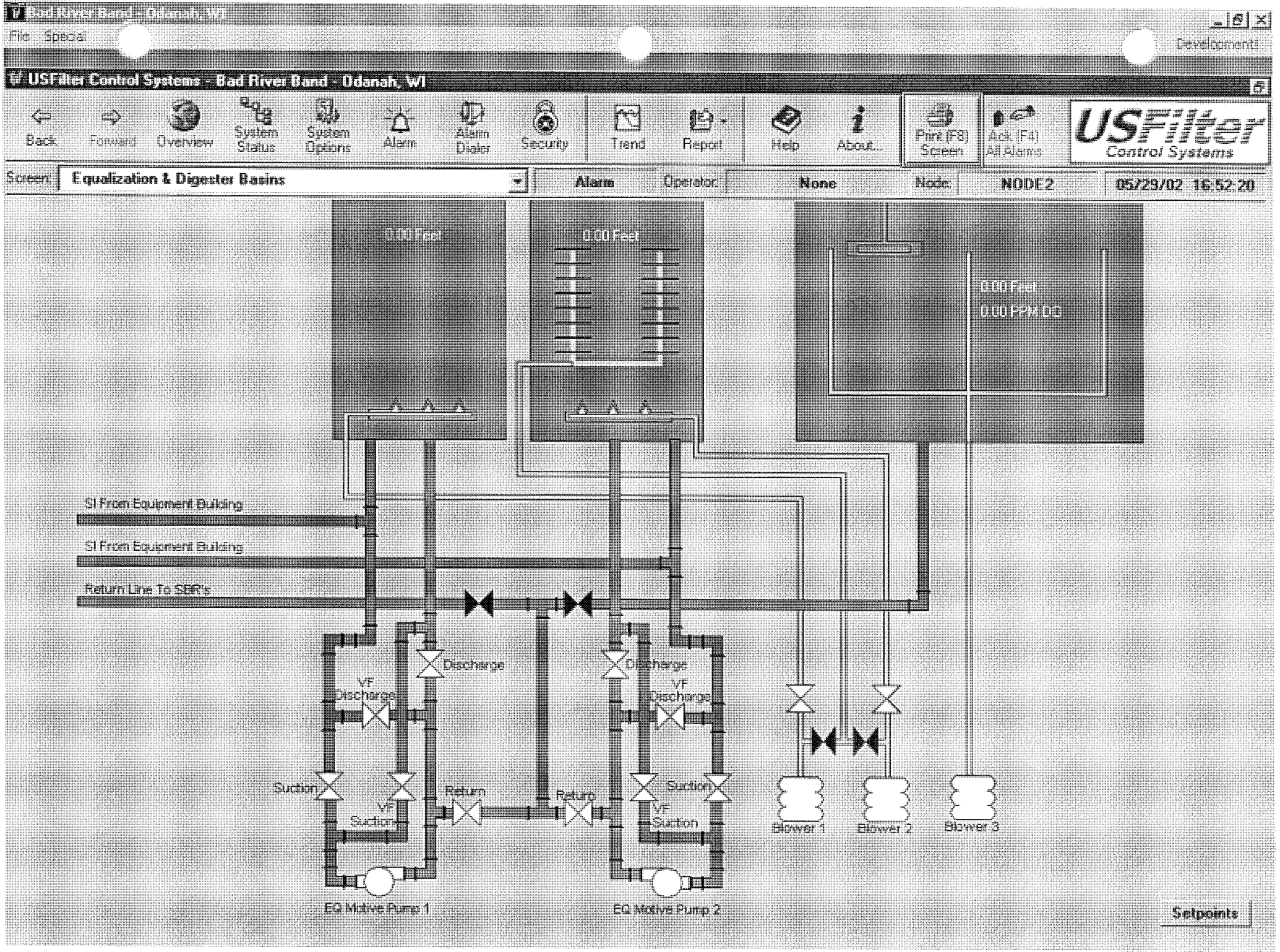
SBR Control Panel 40-LCP-2-1 Control Devices	
HS-2-19-2	Blower 2/3 Isolation Valve OPEN-CLOSE-AUTO switch
HS-2-25-1	EQBasin #1 Air Valve OPEN-CLOSE-AUTO switch
HS-2-25-2	EQBasin #2 Air Valve OPEN-CLOSE-AUTO switch
HS-2-6-1	SBR #1 Pump Suction Valve OPEN-CLOSE AUTO switch
HS-2-6-2	SBR #2 Pump Suction Valve OPEN-CLOSE AUTO switch
HS-2-37-1	EQBasin #1 Pump Suction Valve OPEN-CLOSE-AUTO
HS-2-37-2	EQBasin #2 Pump Suction Valve OPEN-CLOSE-AUTO
HS-2-7-1	SBR #1 Pump Discharge Valve OPEN-CLOSE-AUTO
HS-2-7-2	SBR #2 Pump Discharge Valve OPEN-CLOSE-AUTO
HS-2-38-1	EQBasin #1 Pump Discharge Valve OPEN-CLOSE-AUTO
HS-2-38-2	EQBasin #2 Pump Discharge Valve OPEN-CLOSE-AUTO
HS-2-11-1	SBR #1 WAS Valve OPEN-CLOSE-AUTO switch
HS-2-11-2	SBR #2 WAS Valve OPEN-CLOSE-AUTO switch
HS-2-41-1	EQBasin #1 Return Valve OPEN-CLOSE-AUTO switch
HS-2-41-2	EQBasin #2 Return Valve OPEN-CLOSE-AUTO switch
HS-2-8-1	SBR #1 Backflush Suction Valve OPEN-CLOSE-AUTO
HS-2-8-2	SBR #2 Backflush Suction Valve OPEN-CLOSE-AUTO
HS-2-39-1	EQBasin#1 Backflush Suction Valve OPEN-CLOSE-AUTO
HS-2-39-2	EQBasin#2 Backflush Suction Valve OPEN-CLOSE-AUTO
HS-2-9-1	SBR #1 Backflush Discharge Valve OPEN-CLOSE-AUTO
HS-2-9-2	SBR #2 Backflush Discharge Valve OPEN-CLOSE-AUTO
HS-2-40-1	EQBsn#1 Backflush Dischrge Valve OPEN-CLOSE-AUTO
HS-2-40-2	EQBsn#2 Backflush Dischrge Valve OPEN-CLOSE-AUTO

The following field devices are provided:

Field Devices		
LSH-2-15-1	SBR #1 high level float	Elev. 625.0'
LSH-2-15-2	SBR #2 high level float	Elev. 625.0'
LE-2-28-1	Digester level transducer	1-18'
LE-2-14-1	SBR #1 level transducer	1-18'
LE-2-14-2	SBR #2 level transducer	1-18'
AE/AIT-2-16-1	SBR #1 Oxygen Reduction Potential	
AE/AIT-2-17-1	SBR #1 Dissolved Oxygen	
AE/AIT-2-16-2	SBR #2 Oxygen Reduction Potential	
AE/AIT-2-17-2	SBR #2 Dissolved Oxygen	

The following are screens that appear on the PCs. The operator can make changes on the various "setpoint popup screens."





Bad River Band - Odanah, WI

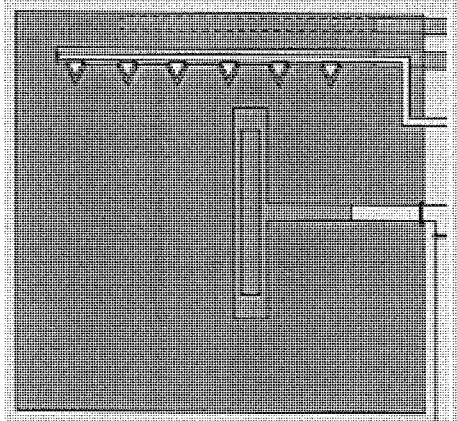
File Special

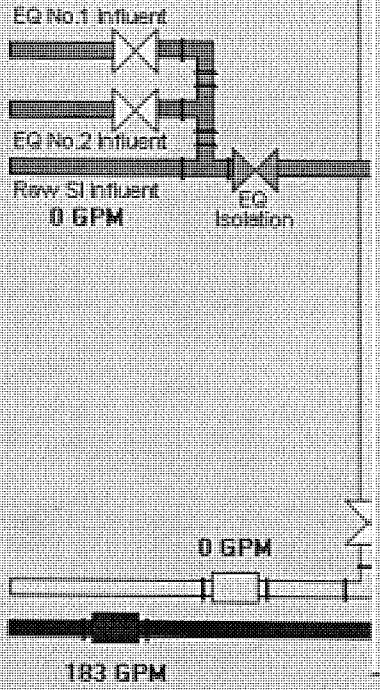
Development

USFilter Control Systems - Bad River Band - Odanah, WI

Back | Forward | Overview | System Status | System Options | Alarm | Alarm Dialer | Security | Trend | Report | Help | About... | Print (F8) Screen | Ack (F4) All Alarms | USFilter Control Systems

Screen: Sequential Batch Reactors | Alarm | Operator: None | Node: NODE2 | 05/29/02 14:20:05





SBR No.1:

Alarm Response:
☑ Disabled ☐ Enable

Static fill	50 %
Air Adjust	0 Min
Bottom Water	13.80 Feet
Top Water	16.00 Feet
Blower On-Time	10 Min
Blower Off-Time	60 Min
Blower On-ORP	-50 mV
Blower Off-D.O.	4.50 PPM

Dissolved Oxygen Option:
☑ Disabled ☐ Enable

Term. Aeration	5.00 PPM
Waste Sludge	0 Min
Waste Sludge	111 Gals

SBR No.2:

Alarm Response:
☑ Disabled ☐ Enable

Static fill	50 %
Air Adjust	0 Min
Bottom Water	13.80 Feet
Top Water	16.00 Feet
Blower On-Time	10 Min
Blower Off-Time	60 Min
Blower On-ORP	-50 mV
Blower Off-D.O.	4.50 PPM

Dissolved Oxygen Option:
☑ Disabled ☐ Enable

Term. Aeration	5.00 PPM
Waste Sludge	0 Min
Waste Sludge	112 Gals

Plant Wide:

Vac Flush	5 Min
Settle	45 Min
Settle Prep	10 Min
Decant Flow Rate	680 GPM

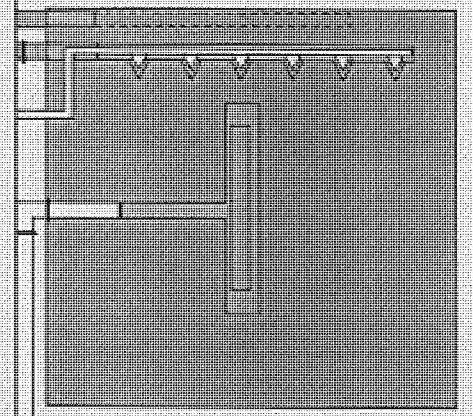
Waste Sludge Frequency:
☑ Once/Day ☐ Every Cycle

1 Tank:

Static Fill	70.00 %
Max. Anox. Fill	90 Min
Air Adjust	0 Min
Air Slope	100 Min
Min. Air	90 Min
Max. Air	180 Min

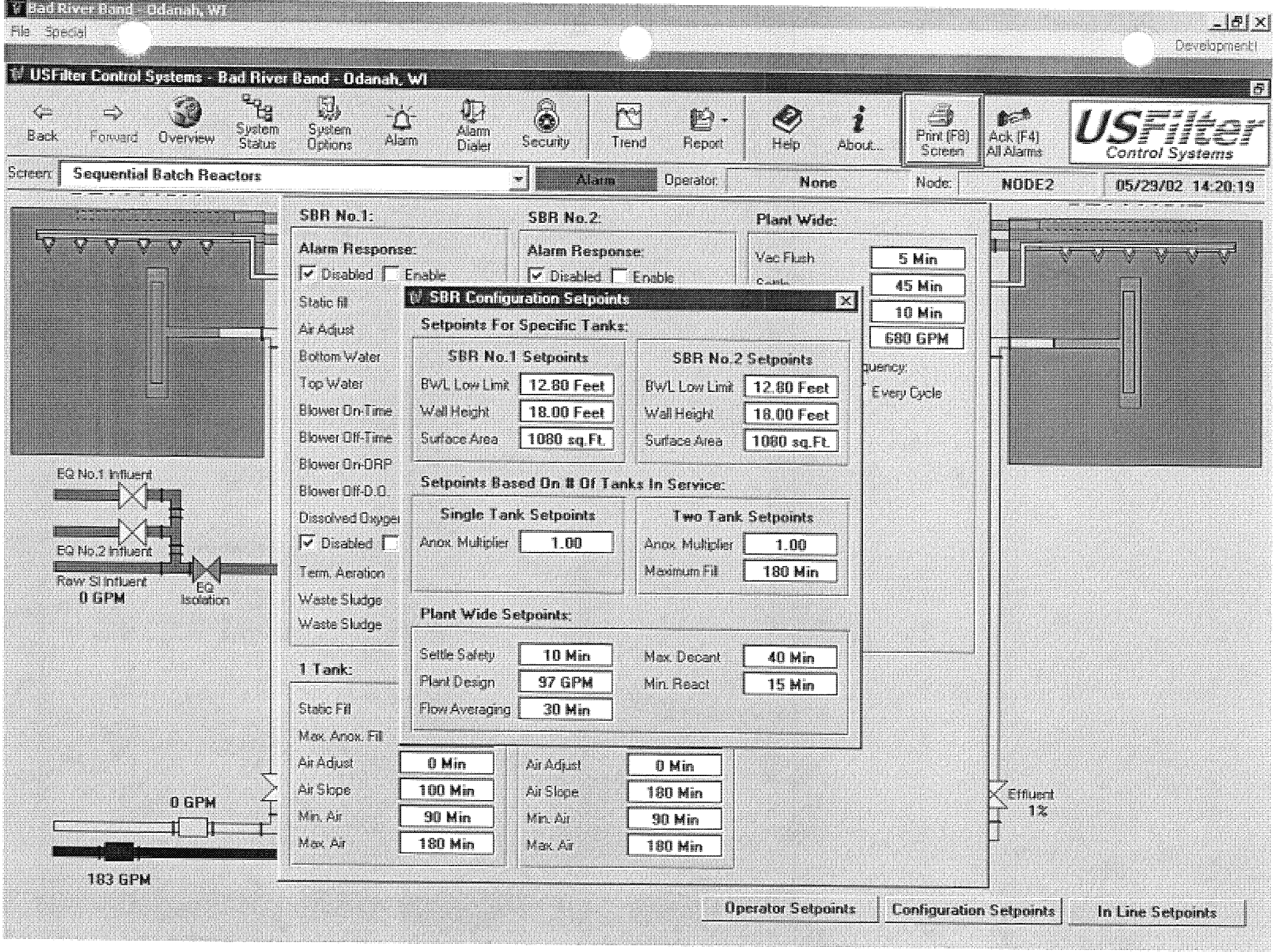
2 Tank:

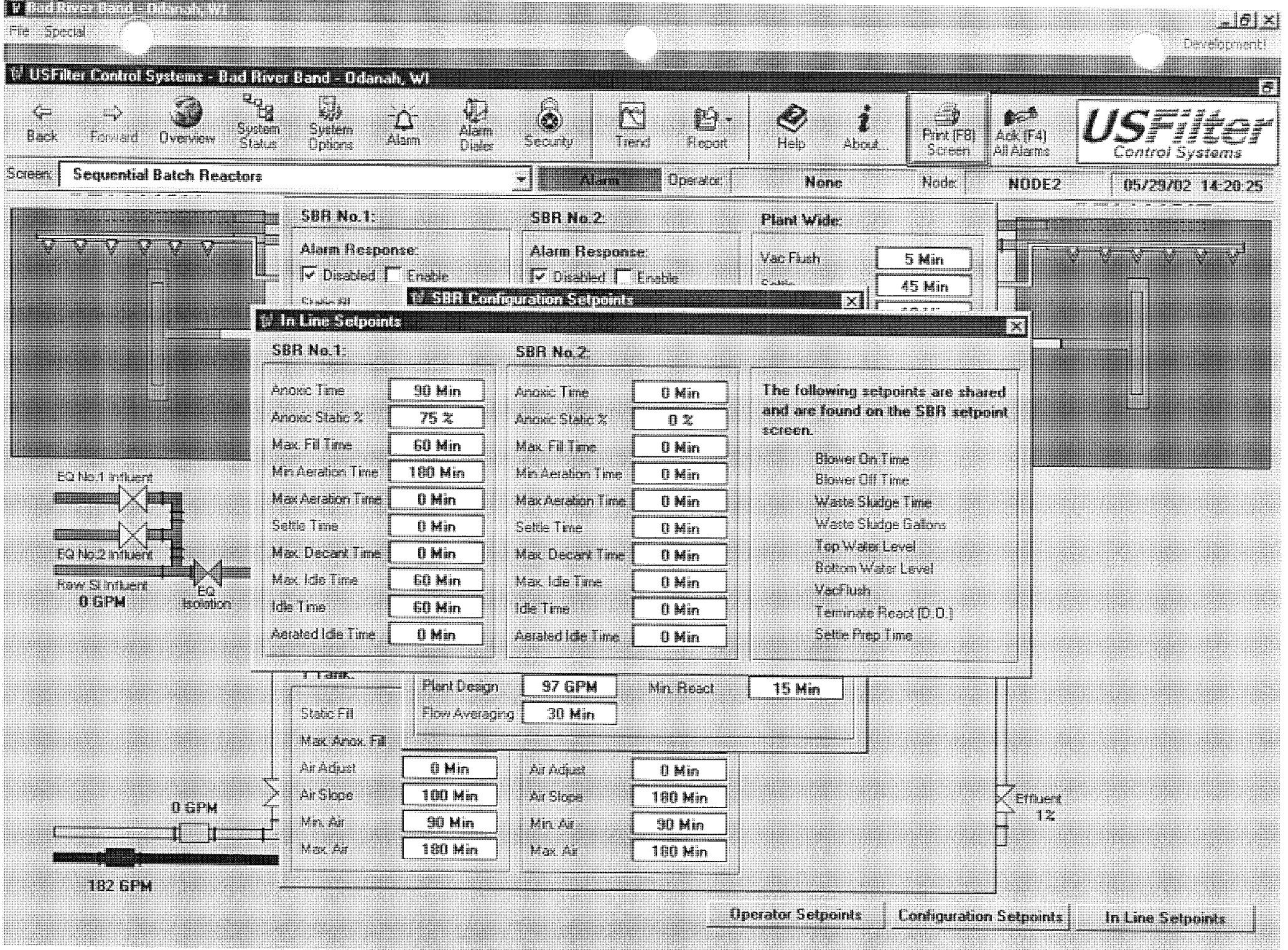
Max. Anox. Fill	100 Min
Air Adjust	0 Min
Air Slope	180 Min
Min. Air	90 Min
Max. Air	180 Min

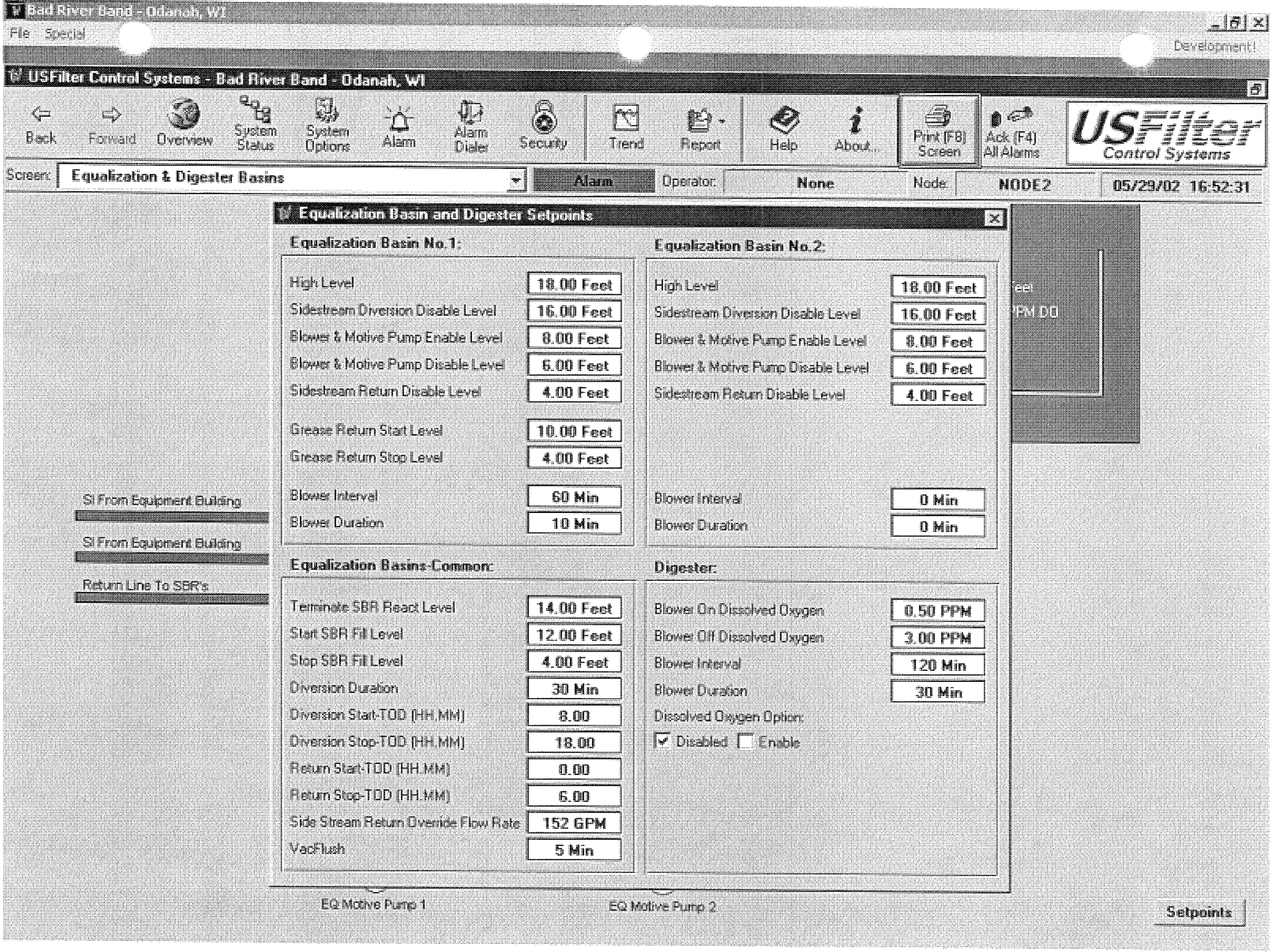


Effluent 2%

Operator Setpoints | Configuration Setpoints | In Line Setpoints







530 OPERATIONS

The minimum water level in a SBR following the DECANT stage is 13.8 feet (elevation 621.8 feet). The maximum water level is 16.0 feet (elevation 624.0 feet). See Figure-SBR.

The maximum volume that can be accepted for treatment between elevations 621.8' and 624.0'in one SBR is approximately 17,700 gallons, which is 98 gpm for 3 hours. The current average flow to the plant is 57,900 gallons per day (40 gpm), and the design average flow is 140,000 gpd (97 gpm). The flow load to an SBR for a batch at design average flow is 3 hours x 60 minutes/hour x 97 gpm = 17,460 gallons. 4 cycles per day.

If the flow exceeds 97 gpm, the SBR control panel will calculate the reduction in time available to treat each batch load in an SBR, and will shorten the time for various batch stages. See the U.S. Filter-Jet Tech information in Appendix B for further discussion of SBR operation and setpoints. Also, see Jet Tech's Operations & Maintenance Manual for further discussion and explanation.

Descriptions of the Four Methods of Operation

This section contains step-by-step descriptions of the four modes of operating the SBR system.

Two computers – the Plant PC and the Utility Manager PC – can monitor the status of SBR operations. Also, these computers are used as the Operator Interface Units to adjust setpoints.

The SBR Control Panel has a modem that allows U.S. Filter-Jet Tech to telephone the SBR Control Panel to view its operation and help diagnose problems.

The following values were initially established as setpoints for automatic control of the SBR system. These setpoints can be adjusted through the Plant PC and Utility Manager PC.

SBR System Setpoints	
Description	**Setting**
All Modes	

SBR Blowers OFF DO level	2 mg/L
SBR Blower ON ORP level	-200 mv
WAS duration	0-60 minutes
WAS flow setpoint	1500 gal/day
SBR Backflush pump duration	10 minutes
Effluent decant flowrate	680 gpm
Sidestream Equalization Mode	
Sidestream diversion start	6:00 am
Sidestream diversion stop	12:00 midnight
Sidestream diversion duration	30 minutes
Sidestream return start	12:00 midnight
Sidestream return stop	6:00 am
EQ blower interval	24 hour timer
EQ blower duration	5 min./hour
EQ Basin high level	Elev. 624.75'
Disable Sidestream Diversion EQ Basin level	Elev. 624.00'
Enable EQ Blower/Motive pump	Elev. 613.00'
Disable EQ Blower	Elev. 612.00'
Disable Sidestream Return EQ Basin level	Elev. 610.00'
Grease Mode	
Start EQ Basin #1 return (Grease Removal Mode)	Elev. 624.50'
Stop EQ Basin #1 return (Grease Removal Mode)	Elev. 623.00'
Inline Mode	
Terminate SBR react (Inline Mode)	PLC-calculated
Start SBR fill batch (Inline Mode)	Elev. 620.20'
Stop SBR fill batch (Inline Mode)	Elev. 614.30'
Digester	
Digester blower interval	24 hour timer
Digester blower duration	30 min./hour
Digester blower OFF DO level	3 mg/L
Digester blower ON DO level	1 mg/L
Equalization backflush duration	10 minutes
Digester low DO	0.5 mg/L

The following are the step-by-step functional descriptions of the several modes of operation:

General Functional Description – All Modes

1. When System MANUAL/AUTO switch (HS-2-1-1) is in MANUAL, control of all components is from the front-of-SBR Control Panel devices (HAND, and OPEN/CLOSE). The AUTO position of the devices is inoperable.

2. In AUTO mode, the respective SBR is operated using PLC signals. All individual devices must also be in AUTO. However, handswitches on the SBR Control Panel operate independently of the PLC. The operator can put individual pieces of equipment in HAND or OPEN/CLOSE, rather than AUTO, and equipment will not generate an alarm until the AUTO sequence calls for the equipment to operate.

3. When System switch is in AUTO and the EQ Basin mode switches (HS-2-32-1, -2) are in SIDESTREAM, GREASE, or INLINE, the PLC monitors all equipment to determine and control correct operating conditions. If the SBR MANUAL/AUTO switch (HS-2-3-1-1 and –2-1) is in MANUAL, the operator must operate each valve manually.

4. Switching between functions will not interrupt the SBR sequence. There is a delay provided before initiating the function to avoid nuisance valve cycling.

5. There is a positive confirmation between steps before the next step is allowed to occur.

6. Valve OPEN lights are on only when the respective valve is full open.

7. HAND functions and OPEN/CLOSE for all equipment bypasses the PLC.

8. All setpoints are adjustable at the Operators PC and Utility Managers PC.

9. Modem XY-2-49-1 enables access to PLC by SBR manufacturer, U.S. Filter-Jet Tech.

SBR Mode Functional Description

In the SBR Mode, the Equalization Basins are not used. SBR #1 and SBR #2 alternate back and forth. The general sequence is SBR #1 is filling for 3 hours. After the 3-hour FILL stage, SBR #1 goes

through the REACT, SETTLE, DECANT, IDLE/WASTE stages in the next 3 hours. After SBR #1 FILL stage, SBR #2 FILL stage begins. The following table shows and example of the SBR steps for a 6-hour total cycle:

Typical SBR Steps for 6-hour Total Cycle									
Cycle:	FILL			REACT	SETTLE	DECANT	IDLE/WASTE		
Time:	180			84	45	30	21		
Sub-cycle	Anoxic Static Fill	Anoxic Mixed Fill	Aerated Fill	Aerated React	Settle	Decant	Waste Sludge	Back Flush	Idle
Time:	72	72	36	84	45	30	5	10	6
Blower:	OFF	OFF	ON	ON	OFF	OFF	OFF	OFF	OFF
Motive Pump	OFF	ON	ON	ON	OFF	OFF	ON	ON	OFF
Inlet Valve	Open	Open	Open	Closed	Closed	Closed	Closed	Closed	Closed
Effluent Valve	Closed	Closed	Closed	Closed	Closed	Closed	Closed	Closed	Closed
WAS Valve	Closed	Closed	Closed	Closed	Closed	Closed	Open	Closed	Closed
Motive Pump Suction Valve	Open	Open	Open	Open	Open	Open	Open	Closed	Open
Motive Pump Discharge Valve	Open	Open	Open	Open	Open	Open	Open	Closed	Open
Backflush Suction Valve	Closed	Closed	Closed	Closed	Closed	Closed	Closed	Open	Closed
Backflush Discharge Valve	Closed	Closed	Closed	Closed	Closed	Closed	Closed	Open	Closed

To automatically operate the SBRs in the SBR Mode, switch the Equalization Basin mode switches (HS-2-32-1 and –2) to SIDESTREAM MODE. Then, set the DIVERSION DURATION clock (KC-2-33-3) to "O minutes." This will eliminate the Equalization Basins from use.

1. SBR MANUAL/AUTO switches (HS-2-3-1-1 and –2-1) control the operation of the SBRs.

2. In MANUAL mode, the respective SBR is operated using switches on the front of the SBR Control Panel. MANUAL mode takes control away from the PLC. Valve control is with the OPEN/CLOSE/AUTO switches. The SBR blower and motive pump control is with their HAND/OFF/AUTO switches. (The AUTO position does not work.)

3. In AUTO mode, the respective SBR is operated by control signals from the PLC.

4. The SBR Blower OFF, TIME/DO switch (HS-2-20-2) will signal the PLC to use DO signals from the DO sensors in the SBRs (AIT-2-17-1 or –2) to turn blowers off (at 2 mg/L) when in DO position. When in TIME position, PLC uses time setpoint.

5. The SBR Blower ON, TIME/ORP switch (HS-2-20-1) will signal the PLC to use ORP (oxidation reduction potential) signals from the ORP sensors in the SBRs (AIT-2-16-1 or –2) to turn blowers on (at –200 mv) when in ORP position. When in TIME position, PLC uses time setpoint.

6. WAS TIME/FLOW mode switch (HS-2-12-1) signals PLC to use flow signals from flow meter (FIT-2-12-1) to control sludge wasting when in FLOW position.

7. WAS TIME/FLOW setpoint can be set at PLC via Plant PC or Utility Manager PC. WAS duration timer setpoint (KC-2-12-1-1) (0 to 60 minutes) is in minutes per batch. WAS flow setpoint (FGC-2-12-1-1) (1500 gpd) is in gallons per day, and the PLC divides the total flow by the number of batches per day to determine the flow per batch.

8. SBR backflush duration timer setpoint (10 minutes) controls the jet aeration header backflush setpoint.

9. The PLC calculates the *SBR Average Influent Flow Rate* based on the change in tank level over time and depending on which SBR tank. The PLC uses the *SBR Average*

Influent Flow Rate to automatically adjust SBR cycles in response to fluctuations in flow.

10. The PLC has *Effluent Decant Flow PID Loop Controller.* The effluent flow rate setpoint (680 gpm) is adjustable via the PCs. The PLC will modulate the SBR Effluent Valve to maintain the effluent setpoint based on the flow signal from Effluent Flow Meter, FIT-2-13-1.

11. Blowers are controlled by placing their control switches in AUTO, and placing LEAD Blower selection switch in "1-2/1-3/3-2." Normally, switch is put in position "1-2." Blower #1 serves SBR #1, Blower #2 serves SBR #2, and Blower #3 is standby. Blower 1/3 Isolation Valve (FV-2-19-1) and Blower 2/3 Isolation Valve (FV-2-19-2) are normally closed. If Blower #1 is switched to OFF, Blower #3 will serve SBR #1. Or, if Blower #2 is switched to OFF, Blower #3 will serve SBR #2. The 1/3 and 2/3 Isolation valves will open automatically if Blowers #1 or #2 fail.

12. If LEAD Blower selection switch is in "3-2" position, SBR Blower #3 serves SBR #1 and SBR Blower #2 serves SBR #2, and SBR Blower #1 acts as standby. Blower 1/3 Isolation Valve automatically opens, and Blower 2/3 Isolation Valve automatically closes. If SBR Blower #2 fails, SBR Blower #3 would change to serve SBR #2, and SBR Blower #1 would start in order to serve SBR #1. Blower 1/3 Isolation Valve would automatically close, and Blower 2/3 Isolation Valve would automatically open.

13. If LEAD Blower selection switch is in "1-3" position, SBR Blower #1 serves SBR #1 and SBR Blower #3 serves SBR #2, and SBR Blower #2 acts as standby. Blower 1/3 Isolation Valve automatically closes, and Blower 2/3 Isolation Valve automatically opens. If SBR Blower #1 fails, SBR Blower #3 would change to serve SBR #1, and SBR Blower #2 would start in order to serve SBR #2. Blower 1/3 Isolation Valve would automatically open, and Blower 2/3 Isolation Valve would automatically close.

14. If one of the lead blowers fails, and there is not a standby blower available, the PLC will automatically put the SBR in "out of service" status.

15. The PLC will skip "waste sludge," "Back flush," and "Idle" cycles, in that order, if PLC-calculated average influent flow rate is great enough that decant cycle is too long to allow completion of setpoint durations for these cycles.

16. PLC will provide "filled decant" cycle if PLC-calculated average influent flow rate is greater than 175% of average daily design flow (175% x 140,000 gpd = 245,000 gpd) for peak flow conditions used in emergency event.

Sidestream Equalization Mode

The normal FILL stage is 3 hours for a SBR. In Sidestream Equalization Mode, a portion of the 3-hour FILL stage is diverted to an equalization basin. For example, SBR #1 is filled for 150 minutes and EQ Basin #1 is filled for 30 minutes. Then SBR #2 is filled for 150 minutes, and EQ Basin #2 is filled for 30 minutes. In this manner, a portion of each SBR FILL stage is diverted to the equalization basins during heavy daytime organic loadings. At night, the flow that was stored in the equalization basins during the day is returned to the SBRs (during their night-time FILL stages) when organic loading is lower.

EQ Basin #1 receives a portion of the flow during an SBR #1 FILL stage during the day. At night, EQ Basin #1 returns its stored flow to SBR #1. In like manner, EQ Basin #2 and SBR #2 work together.

1. Set EQ Tank mode switches (HS-2-32-1 and –2) to SIDESTREAM position.

2. In PLC, set Sidestream Return Start setpoint (this is normally set at midnight).

3. In PLC, set Sidestream Return Stop setpoint (this is normally set at 6:00 am).

4. In PLC, set Sidestream Diversion Duration setpoint (0 – 60 minutes). Duration of 30 minutes is suggested. If a duration of 0 minutes is set, the EQ Basins will not be used, the Sidestream Equalization Mode is effectively disabled, and the *SBR Mode* (explained above) is functional.

5. EQ Basin Isolation Valve (FV-2-2-1) is open.

6. The operator must manually close the sluice gate (G-2-31-1) that connects the two equalization basins.

7. When the EQ Basin mode switch is in "Sidestream," the PLC will calculate the average influent flow rate for EQ Basin #1 at 2,218 gallons/foot (when EQ Basin #1 Influent Valve is open), and will calculate the average influent flow rate for EQ Basin #2 at 2,222 gallons/foot (when EQ Basin #2 Influent Valve is open).

8. The sidestream diversion will occur at the end of the corresponding SBR FILL stage. For example, EQ Basin #1 Influent Valve will open and the SBR #1 Influent Valve will close. At the end of the sidestream diversion duration, SBR #2 Inlet Valve will open, and EQ Basin #1 Inlet Valve will close.

9. When an EQ Basin fills to its enabling level (elevation 613.00'), its corresponding EQ Motive pump runs, and its corresponding EQ Blower runs according to its setpoint interval and duration (set at 5 minutes/hour).

10. The sidestream diversion is stopped if high level (elevation 624.00') is reached in the EQ Basin (the EQ Basin Inlet Valve is closed and flow goes to the next SBR).

11. Between Sidestream Return Start (midnight) and Sidestream Return Stop (6:00 am), the liquid in the EQ Basins is returned to its corresponding SBR. The sidestream return is done at the beginning of each SBR FILL stage. For example, at the start of an SBR #1 FILL stage, EQ Basin #1 Return Valve (FV-2-41-1) opens, EQ Basin #1 Discharge Valve (FV-2-38-1) closes, and EQ Basin #1 Motive Pump returns stored flow to SBR #1.

12. As an EQ Basin empties, when it reaches its disable blower setpoint (elevation 612.00'), the blower is shut off. When the level reaches 610.00', the Motive Pump is shut off, the EQ Basin Return Valve is closed, and EQ Basin Motive Pump Discharge Valve is opened.

13. Back flushing the EQ Basin jet aeration headers is done by the operator manually selecting EQ Backflush Initiate switch (HS-2-35-1 or –2). Backflush duration is 10 minutes. The following happens for example, when EQ Basin #1 Backflush is initiated: Blower stops; Backflush Suction Valve (FV-2-39-1) opens; Backflush Discharge Valve (FV-2-40-1) opens; Pump

#1 Suction Valve (FV-2-37-1) closes; Pump #1 Discharge Valve (FV-2-38-1) closes; Return Valve #1 (FV-2-41-1) closes; EQ Motive Pump #1 starts. The backflush process is disabled if the level is below elevation 613.00'.

Grease Removal Mode

All influent flow is first directed into EQ Basin #2. Influent grease is trapped in EQ Basin #2, and fine bubble aeration is used to float the grease. EQ Basin #2 is maintained at a high level so floating grease will overflow the common wall at elevation 624.75' into the aerobic digester. The liquid level is maintained between elevations 624.50' to 623.00'. Influent flows from EQ Basin #2, through the common wall sluice gate into EQ Basin #1. Influent flow is then pumped from EQ Basin #1 to the SBRs.

1. The PLC "grease removal" logic is activated when EQ Basin mode switches are both in GREASE mode.

2. EQ Basin Isolation Valve (FV-2-2-1) is automatically closed. The operator must manually open sluice gate G-2-31-1, between the two EQ Basins. The PLC will calculate average influent flow rate at 4,400 gallons/foot.

3. EQ Blower valves will be manually opened and closed by the operator.

4. EQ Blower interval and duration timers will be active. Set EQ Blower #2 to operate 50 minutes per hour. Set EQ Blower #1 to operate 10 minutes/hour. The blowers and motive pumps will activate if the level is over 613.00'. The blowers are disabled at 612.00'.

5. As EQ Basins fill, only EQ Basin #1 Motive pump runs. EQ Basin #2 Motive Pump does not run. The blowers run according to their interval/duration timers.

6. When EQ Basin #1 Return level is reached (624.50'), flow is pumped to the SBRs by opening EQ Basin #1 Return Valve (FV-2-41-1) and closing Pump #1 Discharge Valve (FV-2-38-1). When the basin level drops to 623.00', Pump #1 Discharge Valve (FV-2-38-1) opens and EQ Basin #1 Return Valve (FV-2-41-

1) closes. The EQ Basin liquid level cycles between 624.50' and 623.00'.

7. If either EQ Basin #1 or #2 mode switch is changed from GREASE to SIDESTREAM, the stored flow in the EQ Basins is held until the Sidestream Return Start setpoint (midnight) occurs. Stored flow is then returned to the SBRs in accordance with the sidestream return operating logic.

8. If either EQ Basin high level setpoint (elevation 624.75') is reached during GREASE mode, the PLC will open EQ Isolation Valve (FV-2-2-1), close EQ Basin #2 Inlet Valve (FV-2-26-2), put both EQ Basins in "out-of-service" status, and operate both SBRs in normal 2-tank SBR operating strategy.

Inline Equalization

All influent flow is directed to EQ Basin #2, and then flows into EQ Basin #1. Influent flow is then pumped from EQ Basin #1 to the SBRs using the SBR motive pumps. The Inline Equalization mode cycle is 9 hours long. Each cycle treats a constant batch size of approximately 26,000 gallons. The following table shows the SBR steps for a 9-hour total cycle:

SBR Steps for INLINE, 9-hour Total Cycle

Cycle:	FILL	REACT						SETTLE	DECANT	IDLE/WASTE		
Time:	30	390						60	45	45		
Sub-cycle	Mixed Fill	Mixed React1	Aerated React 1	Mixed React2	Aerated React 2	Mixed React3	Aerated React 3	Settle	Decant	Waste	Back Flush	Idle
Time:	30	60	120	30	60	30	90	60	45	10	10	25
SBR Blower	OFF	OFF	ON	OFF	ON	OFF	ON	OFF	OFF	OFF	OFF	OFF
SBR Pump	ON	ON	ON	ON	ON	ON	ON	OFF	OFF	ON	ON	OFF
EQ #1 Inlet Valve	Open	Closed	Closed	Closed	Closed	Closed	Closed	Closed	Closed	Closed	Closed	Closed
EQ #2 Inlet Valve	Closed	Open	Open	Open	Open	Open	Open	Open	Open	Open	Open	Open
EQ Isolation Valve	Open	Closed	Closed	Closed	Closed	Closed	Closed	Closed	Closed	Closed	Closed	Closed
SBR Inlet Valve	Open	Closed	Closed	Closed	Closed	Closed	Closed	Closed	Closed	Closed	Closed	Closed
SBR Effluent Valve	Closed	Closed	Closed	Closed	Closed	Closed	Closed	Closed	Open	Closed	Closed	Closed
SBR WAS Valve	Closed	Closed	Closed	Closed	Closed	Closed	Closed	Closed	Closed	Open	Closed	Closed
Pump Suction Valve	Open	Open	Open	Open	Open	Open	Open	Open	Open	Open	Closed	Open
Pump Discharge Valve	Open	Open	Open	Open	Open	Open	Open	Open	Open	Open	Closed	Open
Backflush Suction Valve	Closed	Closed	Closed	Closed	Closed	Closed	Closed	Closed	Closed	Closed	Open	Closed
[illegible]ush Discharge Valve	Closed	Closed	Closed	Closed	Closed	Closed	Closed	Closed	Closed	Closed	Open	Closed

1. The PLC "inline equalization" logic is activated when EQ Basin mode switches are both in INLINE mode.

2. EQ Basin Isolation Valve (FV-2-2-1) is automatically closed. The operator must manually open sluice gate G-2-31-1 between the two EQ Basins. The PLC will calculate average influent flow rate at 4,400 gallons/foot. EQ Basin #2 Inlet Valve (FV-2-26-2) opens.

3. The EQ blowers and motive pumps will start when the level in the EQ basins reaches elevation 613.00'. The blowers will operate according to their interval/duration setpoint (5 minutes/hour). The blowers will shut off if the EQ basin levels drop to 612.00', and the motive pumps will shut off if the level drops to 610.00'.

4. High-level alarm in the EQ basins (elevation 624.75') will disable and shutdown the EQ basins.

5. SBR motive pumps rapidly draw water from EQ Basin #1 during an SBR FILL stage.

6. The PLC will calculate "Terminate SBR React Level" on the basis of calculated average influent flow rate (based on 4,400 gallons per foot) into the EQ basins. When the level in the EQ basins reaches this calculated level, the SBR that has been in its REACT stage the longest will advance to the SETTLE stage.

7. When the "Start SBR FILL" level is reached (LSHH-2-46-1, elevation 620.20'), flow is pumped from EQ Basin #1 to an SBR by the following sequence: a) stop EQ Motive Pump #1 and Blower #1; b) open EQ Basin #1 Inlet Valve (FV-2-26-1) and close EQ Basin #2 Inlet Valve (FV-2-26-2); c) close respective SBR Effluent, WAS, and Backflush valves; d) open respective SBR motive pump discharge valve and close suction valve; e) open EQ Isolation Valve and SBR Inlet Valve; f) start respective SBR motive pump.

8. When the "Stop SBR FILL Batch" level is reached (LSL-2-46-1, elevation 614.30'), stop the flow from EQ Basin #1 to the SBR by the following sequence: a) open respective SBR motive pump suction valve; b)

close respective SBR Inlet Valve; c) close EQ Isolation Valve (FV-2-2-1); d) open EQ Basin #2 Inlet Valve and close EQ Basin #1 Inlet Valve; e) enable EQ Basin #1 motive pump and blower.

9. The EQ basin liquid levels cycle between elevations 620.20 ' and 614.30' for Start SBR FILL and Stop SBR FILL. This is a volume of approximately 26,000 gallons, and will fill an SBR approximately 3.2 feet.

10. If either EQ basin mode switch is changed from INLINE to SIDESTREAM, the stored flow in the EQ basins is held until the Sidestream Return Start time setpoint is reached (midnight). Stored flow is then returned to SBRs in accordance with the PLC sidestream return logic.

11. If either EQ basin high level setpoint is reached (LSH-2-34-1-1 or –2-1, elevation 624.75') during INLINE mode, the PLC will open the EQ Isolation Valve (FV-2-2-1), close EQ Basin #2 Inlet Valve, put both EQ basins in "out-of-service" status, and operate both SBRs in normal 2-tank SBR operating strategy.

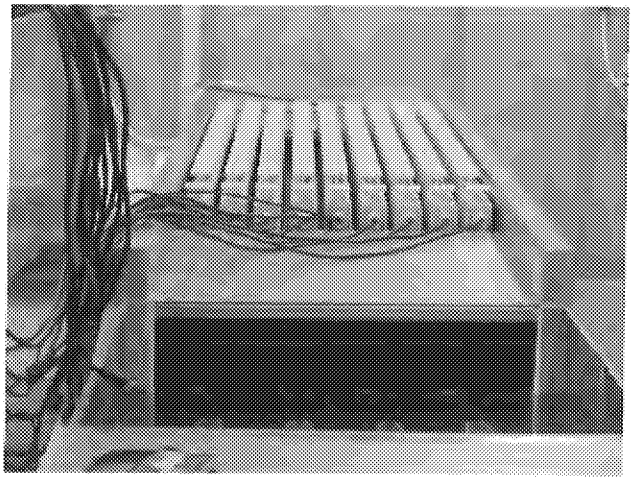
DIVISION 600

UV DISINFECTION

LIST OF FIGURES

DIVISION 600

ULTRAVIOLET DISINFECTION



610 UV SYSTEM DESCRIPTION

After SBR biological treatment, the wastewater contains a multitude of bacteria, some of which can cause disease in humans, including typhoid fever and dysentery. The reduction of the bacteria remaining after biological treatment is achieved by ultraviolet light disinfection

Figure-Screen/UV Building Plans and Figure-Screen/UV Building Sections show views of the UV system.

The UV disinfection system includes a single stainless steel channel with nine UV modules and four ultra violet lamps per module (total of 36 lamps). The submerged lamps emit UV radiation that causes rearrangement and damage to the genetic code of microorganisms, preventing them from reproducing. The system is rated to treat a peak process flow of 1.0 mgd (694 gpm). The SBR Effluent Decant Flow Rate setpoint is 680 gpm.

To provide UV energy, low-pressure mercury lamps are charged by striking an electric arc. The energy generated by excitation of mercury vapor contained in the lamp results in the emission of UV light. The optimum UV wavelength for germicidal effect is 253.7 nanometers (nm).

The intensity of the UV output is measured in milliwatts per square centimeter (mW/sq.cm.). The UV output after 1-year is approximately 65 percent of the output after the 100-hour burn-in period. This output is further reduced to approximately 58 percent at the end of 2 years. A submersible UV sensor is mounted on one UV lamp to measure the UV intensity. That intensity measurement must be representative of the other 35 lamps.

Bad River Indian Tribe WWTP - C:\WWTP\BADRIVERWWTP

File Logic Special

Development!

Legend

June 24, 2015

Node Name: BR1

Operator: operator

Level: 9000

Log On | Log Off

- Legend
- Site Overview
- Influent EQ/Digester
- SBR Overview
- Operator Setpoints
- Effluent Pump Station
- SBR1 Trends
- SBR2 Trends
- Other Trends
- Data Extraction
- MLSS/SRT Calculations
- Run Times/Flow Totals
- N.O. LS1 | N.O. LS2
- N.O. LS3 | Well House
- Dprville LS | Dprvlle Tank
- F.F. LS | F.F. WH
- Emerg. Gen. | B.H. WH
- System Configuration

Print

Integrated Controls, Inc.
15707 South Mahaffie Street
Olathe, KS 66062
(913)782-9600 FAX (913)764-7829

PIPES

PIPE:	SELECT COLOR:
INFLUENT	Yellow
EFFLUENT	Cyan
AIR	Green
SLUDGE	Brown

PUMPS

Pump OFF Color	Pump RUN Color	Pump FAULT Color
White	Green	Red

VALVES

Valve Color OPEN	Valve Color MID	Valve Color CLOSED	Valve Color FAULT
Green	White	Yellow	Red

Hand Valve

Flow Meter

BLOWERS

Blower OFF Color	Blower RUN Color	Blower FAULT Color
White	Green	Red

Alarm Acknowledge

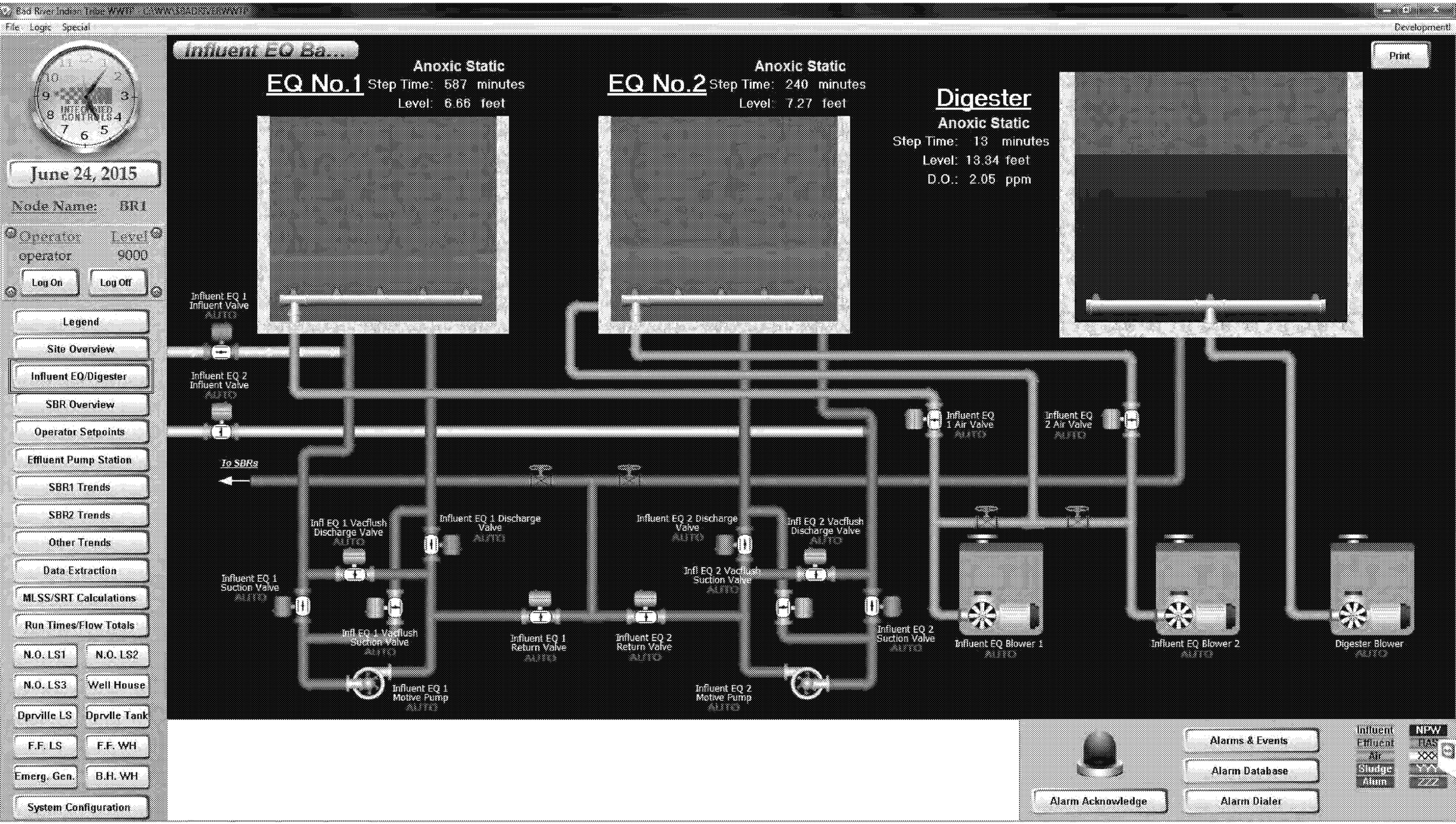
Alarms & Events

Alarm Database

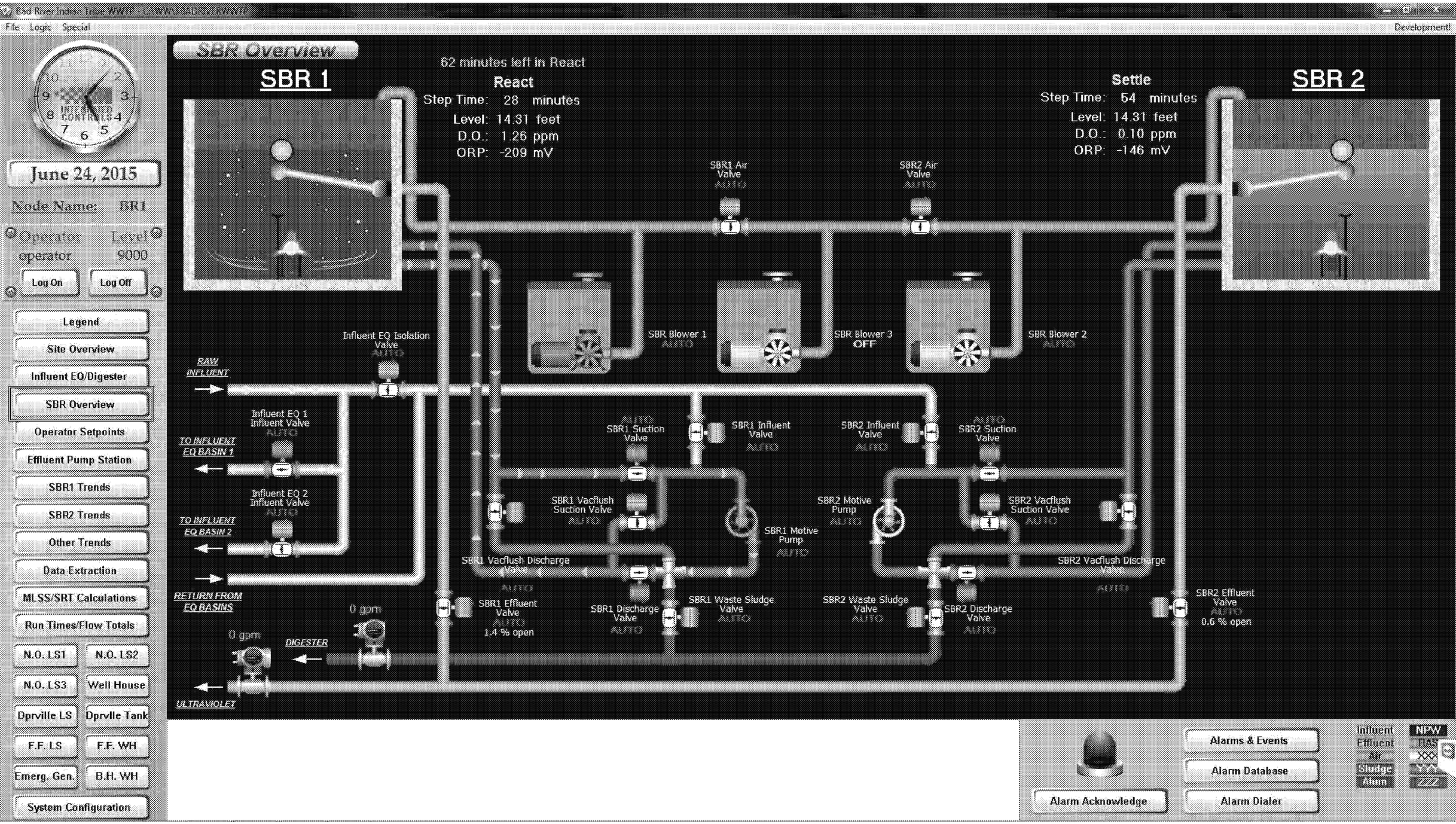
Alarm Dialer

Influent
Effluent
Air
Sludge
Alarm

NPW
RAS



ED_004817A_00032234-00078


Bad River Indian Tribe WWTP - C:\WWTS\BADRIVER\WWTP.
File Logic Special
Development!
SBR Overview
SBR 1
62 minutes left in React
React
Step Time: 28 minutes
Level: 14.31 feet
D.O.: 1.26 ppm
ORP: -209 mV
Settle
Step Time: 54 minutes
Level: 14.31 feet
D.O.: 0.10 ppm
ORP: -146 mV
SBR 2
June 24, 2015
Node Name: BR1
Operator Level
operator 9000
Log On
Log Off
Legend
Site Overview
Influent EQ/Digester
SBR Overview
Operator Setpoints
Effluent Pump Station
SBR1 Trends
SBR2 Trends
Other Trends
Data Extraction
MLSS/SRT Calculations
Run Times/Flow Totals
N.O. LS1
N.O. LS2
N.O. LS3
Well House
Dprville LS
Dprville Tank
F.F. LS
F.F. WH
Emerg. Gen.
B.H. WH
System Configuration
SBR1 Air Valve AUTO
SBR2 Air Valve AUTO
Influent EQ Isolation Valve AUTO
SBR Blower 1 AUTO
SBR Blower 3 OFF
SBR Blower 2 AUTO
RAW INFLUENT
Influent EQ 1 Influent Valve AUTO
TO INFLUENT EQ BASIN 1
Influent EQ 2 Influent Valve AUTO
TO INFLUENT EQ BASIN 2
RETURN FROM EQ BASINS
AUTO SBR1 Suction Valve
SBR1 Influent Valve AUTO
SBR2 Influent Valve AUTO
AUTO SBR2 Suction Valve
SBR1 Vacflush Suction Valve AUTO
SBR1 Motive Pump AUTO
SBR2 Motive Pump AUTO
SBR2 Vacflush Suction Valve AUTO
SBR1 Vacflush Discharge Valve AUTO
SBR2 Vacflush Discharge Valve AUTO
SBR1 Effluent Valve AUTO 1.4 % open
SBR1 Discharge Valve AUTO
SBR1 Waste Sludge Valve AUTO
SBR2 Waste Sludge Valve AUTO
SBR2 Discharge Valve AUTO
SBR2 Effluent Valve AUTO 0.6 % open
0 gpm
0 gpm
DIGESTER
ULTRAVIOLET
Alarms & Events
Alarm Database
Alarm Dialer
Alarm Acknowledge
Influent
Effluent
Air
Sludge
Alum
NPW
RAS

Bad River Indian Tribe WWTP - C:\WWTS\BADRIVER\WWTP.

File Logic Special

Development!

SETPOINTS

Setpoints for Specific Tanks

Print

June 24, 2015

Node Name: BR1

Operator Level
operator 9000

Log On | Log Off

Legend
Site Overview
Influent EQ/Digester
SBR Overview
Operator Setpoints
Effluent Pump Station
SBR1 Trends
SBR2 Trends
Other Trends
Data Extraction
MLSS/SRT Calculations
Run Times/Flow Totals
N.O. LS1 | N.O. LS2
N.O. LS3 | Well House
Dprville LS | Dprville Tank
F.F. LS | F.F. WH
Emerg. Gen. | B.H. WH
System Configuration

Equalization Basin No.1:
(○) Manual (●) Automatic
High Alarm Level: 14.00 feet
Low Alarm Level: 2.00 feet
Anoxic Static Time: 660 minutes
Anoxic Mix Time: 60 minutes
Aeration Duration: 0 Minutes
Vacflush Duration: 5 minutes

Equalization Basin No.2:
(○) Manual (●) Automatic
High Alarm Level: 14.00 feet
Low Alarm Level: 2.00 feet
Anoxic Static Time: 660 minutes
Anoxic Mix Time: 60 minutes
Aeration Duration: 0 Minutes
Vacflush Duration: 0 minutes

Common Setpoints:
Terminate SBR React Level: 12.00 feet
Initiate Fill Level: 7.00 feet
Fill Cutoff Level: 6.00 feet

Level Transducer Selector
(●) Infl. EQ 1 (○) Infl. EQ 2

Tank To Fill Selector
(●) Infl. EQ 1 (○) Infl. EQ 2

Tank To Transfer Selector
(○) Infl. EQ 1 (●) Infl. EQ 2

SBR 1 Operation
(○) Manual (●) Automatic

SBR 1 Setpoints
Anoxic Time: 60 minutes
Anoxic Static Percent: 0 percent
Maximum Fill Time: 120 minutes
Minimum Aeration Time: 60 minutes
Maximum Aeration Time: 90 minutes
Minimum React Time: 10 minutes
Blower On Duration: 20 minutes
Blower Off Duration: 0 minutes

SBR 1 D.O. Option
(○) Disabled (●) Enabled

D.O. Air Off: 2.50 ppm
D.O. Air On: 0.40 ppm
Term. Aeration: 10.00 ppm

Vacflush Time: 5 minutes
Settle Time: 60 minutes
Maximum Decant Time: 30 minutes
Max. Waste Sludge Time: 0.8 minutes
Min. Waste Sludge Time: 0.6 minutes
Maximum Idle Time: 5 minutes
Idle Time: 5 minutes
Aerated Idle Time: 0 minutes

SBR 1 Level Setpoints
Bottom water: 13.80 feet
Top water: 14.60 feet

SBR 2 Operation
(○) Manual (●) Automatic

SBR 2 Setpoints
Anoxic Time: 60 minutes
Anoxic Static Percent: 0 percent
Maximum Fill Time: 120 minutes
Minimum Aeration Time: 60 minutes
Maximum Aeration Time: 90 minutes
Minimum React Time: 10 minutes
Blower On Duration: 20 minutes
Blower Off Duration: 0 minutes

SBR 2 D.O. Option
(○) Disabled (●) Enabled

D.O. Air Off: 2.50 ppm
D.O. Air On: 0.40 ppm
Term. Aeration: 10.00 ppm

Vacflush Time: 10 minutes
Settle Time: 65 minutes
Maximum Decant Time: 30 minutes
Max. Waste Sludge Time: 0.8 minutes
Min. Waste Sludge Time: 0.6 minutes
Maximum Idle Time: 5 minutes
Idle Time: 5 minutes
Aerated Idle Time: 0 minutes

SBR 2 Level Setpoints
Bottom water: 13.80 feet
Top water: 14.60 feet

Digester Setpoints
High Alarm Level: 15.80 feet
Low Alarm Level: 3.00 feet

Digester D.O. Option
(○) Disabled (●) Enabled

Blower Off D.O. Level: 3.00 ppm
Blower On D.O. Level: 1.00 ppm

Blower On Time: 15 minutes
Blower Off Time: 65 minutes

Initiate Digester Settling
☐ Sunday
☐ Monday
☐ Tuesday
☐ Wednesday
☐ Thursday
☐ Friday
☐ Saturday

Time of Day: 0 HHMM
Settle Duration: 0 minutes

Plant Wide Setpoints

Settle Prep.: 5.0 minutes
Target Effluent Flow Rate: 500 gpm
Effluent Valve Setpoints
Maximum Initial Open Time: 40 seconds
Minimum Initial Open Time: 20 seconds

Waste Sludge Frequency
(●) Every Cycle (○) Once per day
Waste Sludge Time of Day: 7.00 HH.MM

The setpoint values shown on this page are the recommended initial values for operation.

Alarms & Events
Alarm Database
Alarm Dialer
Alarm Acknowledge

Influent
Effluent
Air
Sludge
Alarm

NPW
RAS
XXX
YYY
ZZZ

Bad River Indian Tribe WWTP - C:\WIN_SBADRIVERWWTP

File Logic Special

Development!

Effluent Pump Station

	Status		Runtime		Starts Today	Yesterday
Wetwell High Level	Normal	Pump No.1	Stopped	0.4 Hrs	10	13
Wetwell Low Level	Normal	Pump No.2	Stopped	0.4 Hrs	10	12
Backup Active	Normal					

INTEGRATED CONTROLS

June 24, 2015

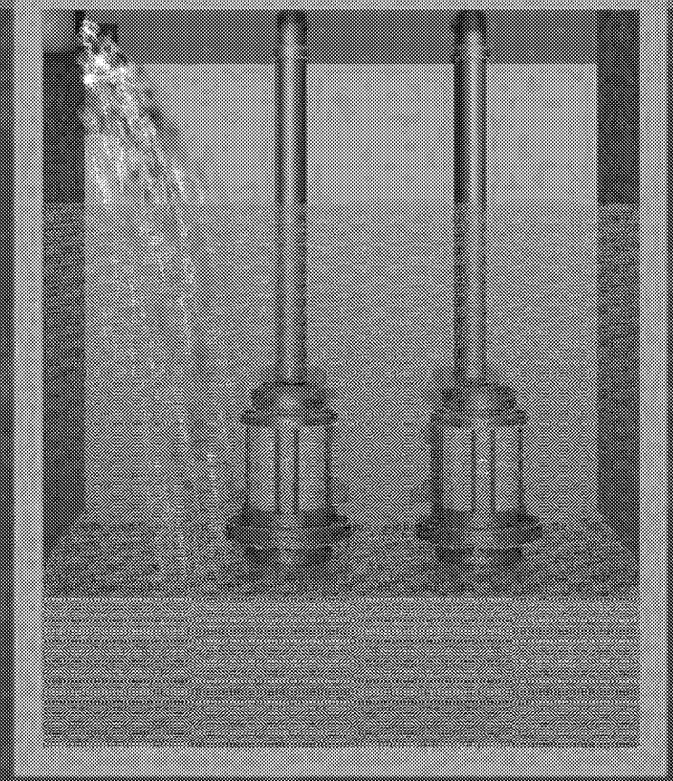
Node Name: BR1

Operator: operator

Level: 9000

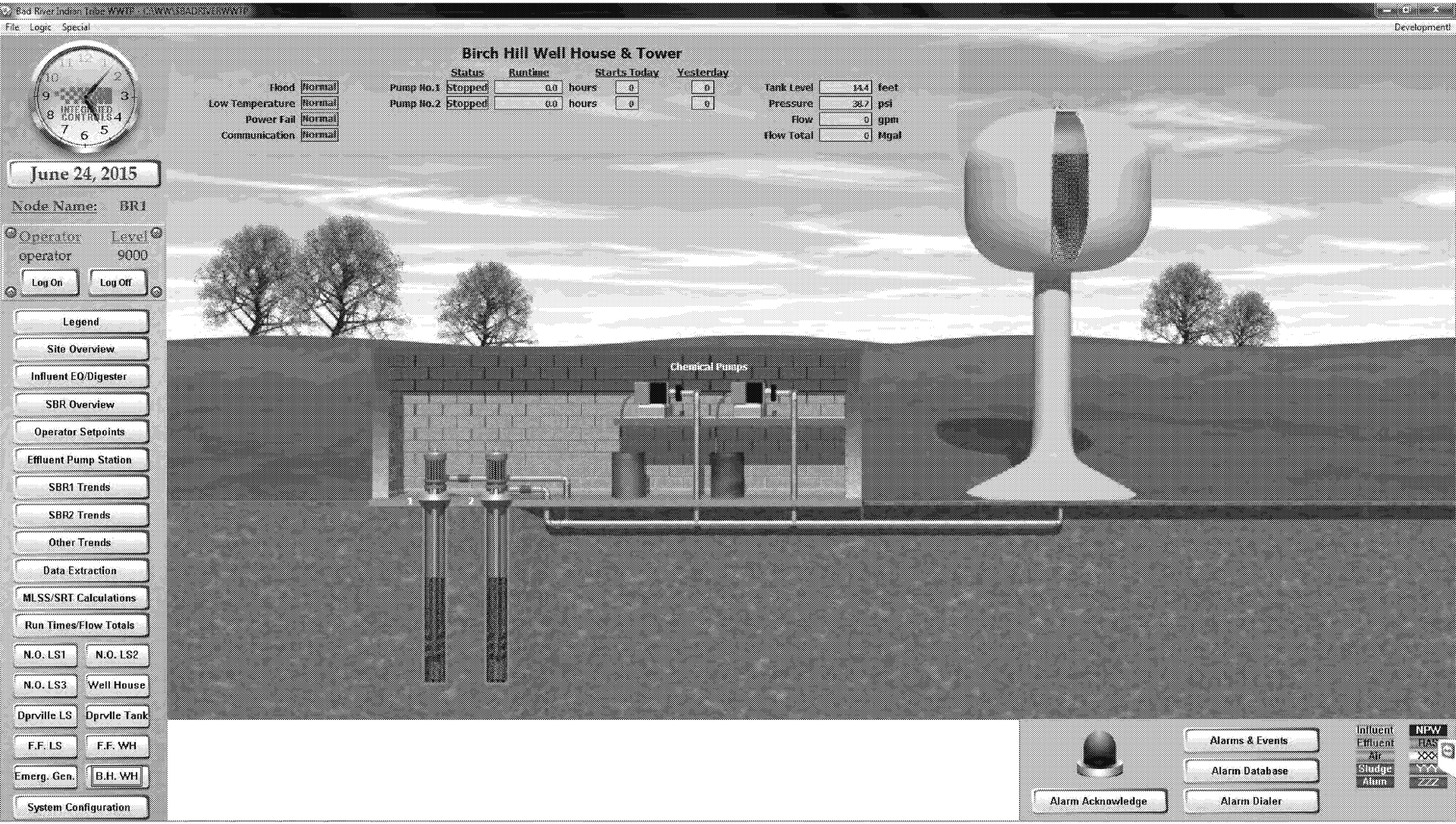
Log On | Log Off

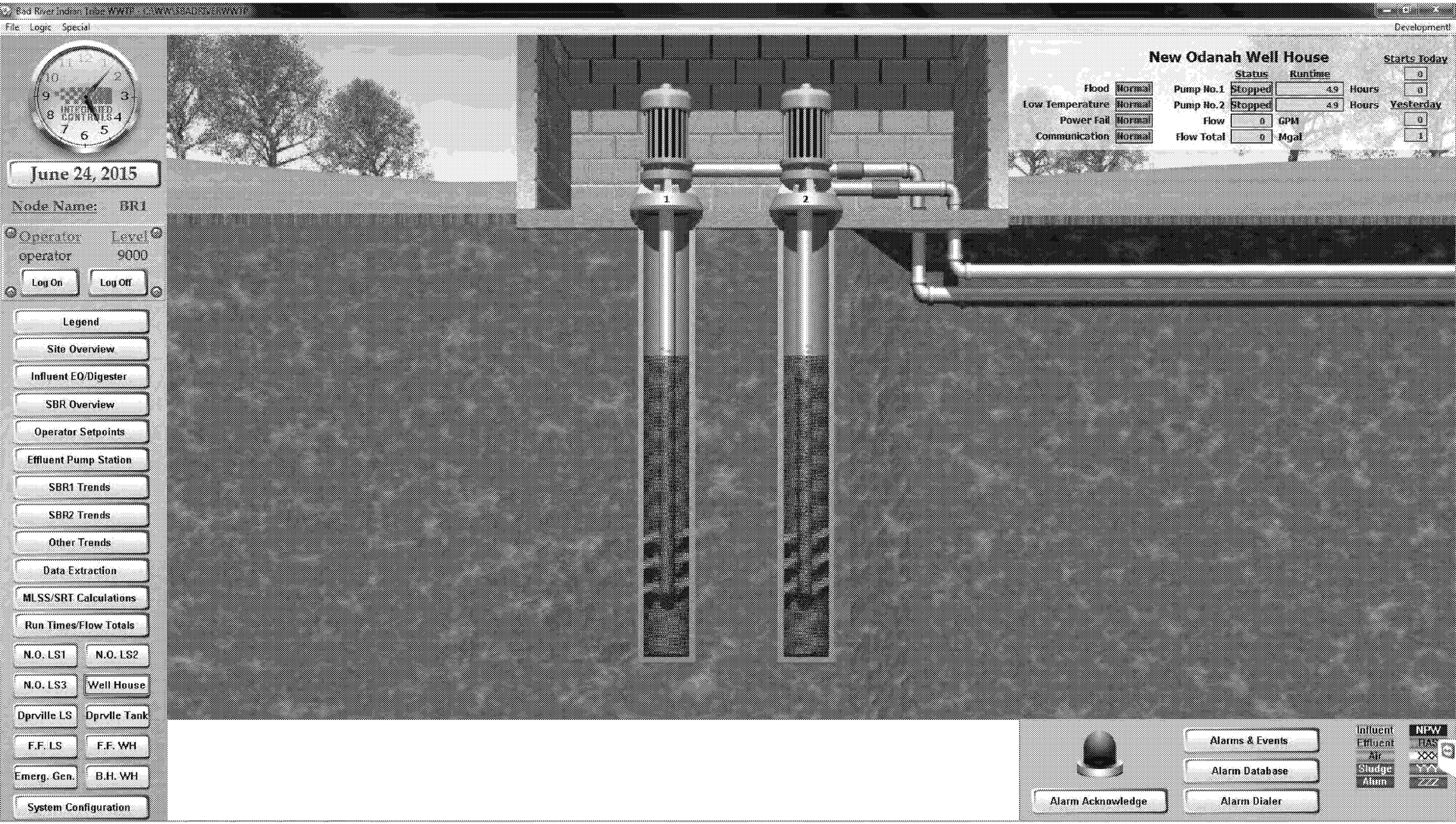
- Legend
- Site Overview
- Influent EQ/Digester
- SBR Overview
- Operator Setpoints
- Effluent Pump Station
- SBR1 Trends
- SBR2 Trends
- Other Trends
- Data Extraction
- MLSS/SRT Calculations
- Run Times/Flow Totals
- N.O. LS1 | N.O. LS2
- N.O. LS3 | Well House
- Dprville LS | Dprvlle Tank
- F.F. LS | F.F. WH
- Emerg. Gen. | B.H. WH
- System Configuration



Alarm Acknowledge | Alarms & Events | Alarm Database | Alarm Dialer

Influent | Effluent | Air | Sludge | Alum | NPW | RAS


Bad River Indian Tribe WWTP - C:\WWTS\BADRIVER\WWTP.
File Logic Special
Development!
Birch Hill Well House & Tower
Status Runtime Starts Today Yesterday
Flood Normal
Low Temperature Normal
Power Fail Normal
Communication Normal
Pump No.1 Stopped 0.0 hours 0 0
Pump No.2 Stopped 0.0 hours 0 0
Tank Level 14.4 feet
Pressure 38.7 psi
Flow 0 gpm
Flow Total 0 Mgal
June 24, 2015
Node Name: BR1
Operator Level
operator 9000
Log On
Log Off
Legend
Site Overview
Influent EQ/Digester
SBR Overview
Operator Setpoints
Effluent Pump Station
SBR1 Trends
SBR2 Trends
Other Trends
Data Extraction
MLSS/SRT Calculations
Run Times/Flow Totals
N.O. LS1
N.O. LS2
N.O. LS3
Well House
Dprville LS
Dprville Tank
F.F. LS
F.F. WH
Emerg. Gen.
B.H. WH
System Configuration
Chemical Pumps
Alarms & Events
Alarm Database
Alarm Dialer
Alarm Acknowledge
Influent
Effluent
Air
Sludge
Alum
NPW
RAS


Bad River Indian Tribe WWTP - C:\WWTS\BADRIVER\WWTP
File Logic Special
Development!
June 24, 2015
Node Name: BR1
Operator Level
operator 9000
Log On
Log Off
Legend
Site Overview
Influent EQ/Digester
SBR Overview
Operator Setpoints
Effluent Pump Station
SBR1 Trends
SBR2 Trends
Other Trends
Data Extraction
MLSS/SRT Calculations
Run Times/Flow Totals
N.O. LS1
N.O. LS2
N.O. LS3
Well House
Dprville LS
Dprvlle Tank
F.F. LS
F.F. WH
Emerg. Gen.
B.H. WH
System Configuration
New Odanah Well House
Starts Today
Status
Runtime
Flood Normal
Pump No.1 Stopped 4.9 Hours
Low Temperature Normal
Pump No.2 Stopped 4.9 Hours
Yesterday
Power Fail Normal
Flow 0 GPM
Communication Normal
Flow Total 0 Mgal
1
2
Alarms & Events
Alarm Database
Alarm Acknowledge
Alarm Dialer
Influent
Effluent
Air
Sludge
Alum
NPW
RAS


Bad River Indian Tribe WWTP - C:\WIN_SADES\BRWWTP
File Logic Special
Development!
Diaperville Hydropneumatic Tank
Status Runtime Starts Today Yesterday
Low Pressure Normal
Low Temperature Normal
Power Fail Normal
Communication Normal
Pump No.1 Running 16.1 hours 0 0
Pump No.2 Stopped 0.0 hours 0 0
Compressor Stopped 0.0 hours 0 0
INTEGRATED CONTROLS
June 24, 2015
Node Name: BR1
Operator Level
operator 9000
Log On
Log Off
Legend
Site Overview
Influent EQ/Digester
SBR Overview
Operator Setpoints
Effluent Pump Station
SBR1 Trends
SBR2 Trends
Other Trends
Data Extraction
MLSS/SRT Calculations
Run Times/Flow Totals
N.O. LS1
N.O. LS2
N.O. LS3
Well House
Dprville LS
Dprville Tank
F.F. LS
F.F. WH
Emerg. Gen.
B.H. WH
System Configuration
Compressor
Hydropneumatic Tank
To Distribution
Alarm Acknowledge
Alarms & Events
Alarm Database
Alarm Dialer
Influent
Effluent
Air
Sludge
Alum
NPW
RAS


Bad River Indian Tribe WWTP - L:\WWTP\SBR\SBR.WWTP
File Logic Special
Development!
SBR1 Trends
04:45:51
Zoom In
12h
Zoom Out
16:45:51
4 hours
1 hour
Minutes
30 minutes
10 minutes
Print
Help
Jun 24 04:45:51
Jun 24 07:45:51
Jun 24 10:45:51
Jun 24 13:45:51
Jun 24 16:45:51
18
16
14
11
9
7
5
2
0
Anoxic Mixed
Anoxic Static
Waste Sludge
Filled Decant
Decant
Filled Settle
Settle
Vacflush
React
React DeNit.
Filled DeNit.
Aerated Fill
Mixed Fill
Static Fill
Aerated Idle
Idle
Off
04:45:51
16:45:51
June 24, 2015
Node Name: BR1
Operator Level
operator 9000
Log On
Log Off
Legend
Site Overview
Influent EQ/Digester
SBR Overview
Operator Setpoints
Effluent Pump Station
SBR1 Trends
SBR2 Trends
Other Trends
Data Extraction
MLSS/SRT Calculations
Run Times/Flow Totals
N.O. LS1
N.O. LS2
N.O. LS3
Well House
Dprville LS
Dprville Tank
F.F. LS
F.F. WH
Emerg. Gen.
B.H. WH
System Configuration
SBR1Step
SBR1 step number
SBR1DO
SBR1 dissolved oxygen
SBR1Level
SBR1 level
InfEQTankLevel
Influent EQ Tank 1 Level
SBR1ORP
SBR1 Oxygen Reduction Pot
Alarms & Events
Alarm Database
Alarm Dialer
Alarm Acknowledge
Influent
Effluent
Air
Sludge
Alarm
NPW
RAS

Bad River Indian Tribe WWTP - C:\WW\BADRIVER\WWTP

File Logic Special Development!

Data Extraction

June 24, 2015

Node Name: BR1

Operator Level
operator 9000

Log On | Log Off

Legend
Site Overview
Influent EQ/Digester
SBR Overview
Operator Setpoints
Effluent Pump Station
SBR1 Trends
SBR2 Trends
Other Trends
Data Extraction
MLSS/SRT Calculations
Run Times/Flow Totals
N.O. LS1 | N.O. LS2
N.O. LS3 | Well House
Dprville LS | Dprville Tank
F.F. LS | F.F. WH
Emerg. Gen. | B.H. WH
System Configuration

Print
Help

1 - Click to Initialize First!

2 - Enter file path to directory where historical data files can be found
example: c:\data_log
Data Directory:

3 - Enter file path to directory where InTouch Database is located
example: c:\ww
Database Directory:

4 - Enter starting date for historical data (MM/DD/YYYY)
example: 11/29/2009
Start Date:

5 - Enter start time for historical data (HH:MM:SS)
example: 14:30:00
Start Time:

6 - Enter length of time for historical data
example: 1w = 1week, 1d = 1day, 1h = 1hour, 1m = 1minute, 1s = 1second, 0 = 1sample
Duration:

7 - Enter length of time between samples
example: 1w = 1week, 1d = 1day, 1h = 1hour, 1m = 1minute, 1s = 1second, 0 = 1sample
Interval:

8 - Enter file path and name of file to write data to (including the .csv extension)
example: c:\ww\data_log\rawdata.csv
Filename:

Note: Max length of time allowed for Duration & Interval is 6 weeks. Fractional values are allowed i.e. .25d = 6hrs

9 - Write Data Message: None

10 - Open file with Excel | Windows Explorer

Alarm Acknowledge
Alarms & Events
Alarm Database
Alarm Dialer

Influent
Effluent
Air
Sludge
Alum
NPW
RAS

Bad River Indian Tribe WWTP - C:\WW SBADRIVERWWTP

File Logic Special Development!

Alarm Dialer

February 25, 2015

Node Name: BR1

Operator Level
None 0

Log On | Log Off

Legend
Site Overview
Influent EQ/Digester
SBR Overview
Operator Setpoints
Effluent Pump Station
SBR1 Trends
SBR2 Trends
Other Trends
Data Extraction
Run Times/Flow Totals
N.O. LS1 | N.O. LS2
N.O. LS3 | Well House
Dprville LS | Dprvlle Tank
F.F. LS | F.F. WH
Emerg. Gen. | B.H. WH

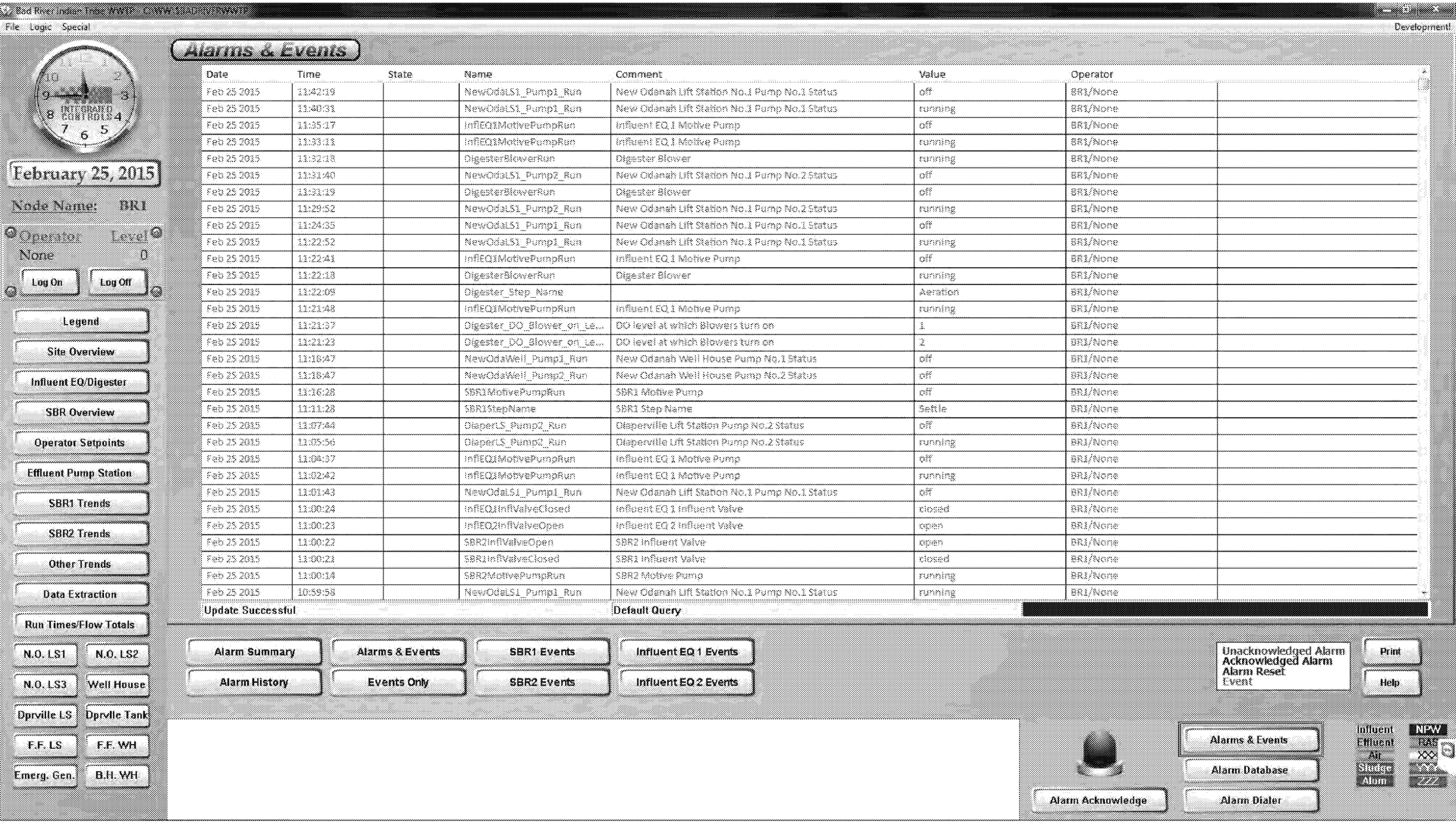
Alarm Dialer Channel Configuration

Channel	Description	Active	Control	Channel	Description	Active	Control
1	Lift Station No.1 High Level		Disabled	17	SBR No.2 High Level		Enabled
2	Normal Power Fail		Disabled	18	SBR Common Alarm		Disabled
3	Generator Run		Enabled	19	Equalization Basin No.1 High Level		Enabled
4	Screen / UV Building Flood		Disabled	20	Equalization Basin No.2 High Level		Enabled
5	Effluent Pump Station High Level		Disabled	21	Aerobic Digester High Level		Disabled
6	New Odanah Lift Station No.1 Alarm		Disabled	22	Odanah Water Tower Alarms		Disabled
7	New Odanah Lift Station No.2 Alarm		Disabled	23	SBR Motive Pump Alarms		Enabled
8	New Odanah Lift Station No.3 Alarm		Disabled	24	SBR Blower Alarms		Enabled
9	Franksfield Lift Station Alarm		Disabled	25	Spare		Disabled
10	Diaperville Lift Station Alarm		Disabled	26	Spare		Disabled
11	Franksfield Pump Station Alarm		Disabled	27	Spare		Disabled
12	Birch Hill Pump Station Alarm		Disabled	28	Spare		Disabled
13	Diaperville Hydropneumatic Tank Alarm		Disabled	29	Spare		Disabled
14	New Odanah Well House Alarm		Disabled	30	Spare		Disabled
15	Pump Room Alarm		Disabled	31	Spare		Disabled
16	SBR No.1 High Level		Enabled	32	Odanah Water Tower Communications		Disabled

Alarm Acknowledge

Alarms & Events
Alarm Database
Alarm Dialer

Influent NPW
Effluent RAS
Air
Sludge
Alarm


Bad River Indian Tribe WWTP - C:\WWTP\BRWWTP
File Logic Special
Development
Alarms & Events
INTEGRATED CONTROLS
February 25, 2015
Node Name: BR1
Operator Level
None 0
Log On
Log Off
Legend
Site Overview
Influent EQ/Digester
SBR Overview
Operator Setpoints
Effluent Pump Station
SBR1 Trends
SBR2 Trends
Other Trends
Data Extraction
Run Times/Flow Totals
N.O. LS1
N.O. LS2
N.O. LS3
Well House
Dprville LS
Dprville Tank
F.F. LS
F.F. WH
Emerg. Gen.
B.H. WH
Date Time State Name Comment Value Operator
Feb 25 2015 11:42:19 NewOdaLS1_Pump1_Run New Odanah Lift Station No.1 Pump No.1 Status off BR1/None
Feb 25 2015 11:40:31 NewOdaLS1_Pump1_Run New Odanah Lift Station No.1 Pump No.1 Status running BR1/None
Feb 25 2015 11:35:17 InflEQ1MotivePumpRun Influent EQ 1 Motive Pump off BR1/None
Feb 25 2015 11:33:11 InflEQ1MotivePumpRun Influent EQ 1 Motive Pump running BR1/None
Feb 25 2015 11:32:18 DigesterBlowerRun Digester Blower running BR1/None
Feb 25 2015 11:31:40 NewOdaLS1_Pump2_Run New Odanah Lift Station No.1 Pump No.2 Status off BR1/None
Feb 25 2015 11:31:19 DigesterBlowerRun Digester Blower off BR1/None
Feb 25 2015 11:29:52 NewOdaLS1_Pump2_Run New Odanah Lift Station No.1 Pump No.2 Status running BR1/None
Feb 25 2015 11:24:35 NewOdaLS1_Pump1_Run New Odanah Lift Station No.1 Pump No.1 Status off BR1/None
Feb 25 2015 11:22:52 NewOdaLS1_Pump1_Run New Odanah Lift Station No.1 Pump No.1 Status running BR1/None
Feb 25 2015 11:22:41 InflEQ1MotivePumpRun Influent EQ 1 Motive Pump off BR1/None
Feb 25 2015 11:22:18 DigesterBlowerRun Digester Blower running BR1/None
Feb 25 2015 11:22:09 Digester_Step_Name Aeration BR1/None
Feb 25 2015 11:21:48 InflEQ1MotivePumpRun Influent EQ 1 Motive Pump running BR1/None
Feb 25 2015 11:21:37 Digester_DO_Blower_on_Le... DO level at which Blowers turn on 1 BR1/None
Feb 25 2015 11:21:23 Digester_DO_Blower_on_Le... DO level at which Blowers turn on 2 BR1/None
Feb 25 2015 11:18:47 NewOdaWell_Pump1_Run New Odanah Well House Pump No.1 Status off BR1/None
Feb 25 2015 11:18:47 NewOdaWell_Pump2_Run New Odanah Well House Pump No.2 Status off BR1/None
Feb 25 2015 11:16:28 SBR1MotivePumpRun SBR1 Motive Pump off BR1/None
Feb 25 2015 11:11:28 SBR1StepName SBR1 Step Name Settle BR1/None
Feb 25 2015 11:07:44 DiaperLS_Pump2_Run Diaperville Lift Station Pump No.2 Status off BR1/None
Feb 25 2015 11:05:56 DiaperLS_Pump2_Run Diaperville Lift Station Pump No.2 Status running BR1/None
Feb 25 2015 11:04:37 InflEQ1MotivePumpRun Influent EQ 1 Motive Pump off BR1/None
Feb 25 2015 11:02:42 InflEQ1MotivePumpRun Influent EQ 1 Motive Pump running BR1/None
Feb 25 2015 11:01:43 NewOdaLS1_Pump1_Run New Odanah Lift Station No.1 Pump No.1 Status off BR1/None
Feb 25 2015 11:00:24 InflEQ1InflValveClosed Influent EQ 1 Influent Valve closed BR1/None
Feb 25 2015 11:00:23 InflEQ2InflValveOpen Influent EQ 2 Influent Valve open BR1/None
Feb 25 2015 11:00:22 SBR2InflValveOpen SBR2 Influent Valve open BR1/None
Feb 25 2015 11:00:21 SBR1InflValveClosed SBR1 Influent Valve closed BR1/None
Feb 25 2015 11:00:14 SBR2MotivePumpRun SBR2 Motive Pump running BR1/None
Feb 25 2015 10:59:58 NewOdaLS1_Pump1_Run New Odanah Lift Station No.1 Pump No.1 Status running BR1/None
Update Successful
Default Query
Alarm Summary
Alarms & Events
SBR1 Events
Influent EQ 1 Events
Alarm History
Events Only
SBR2 Events
Influent EQ 2 Events
Unacknowledged Alarm
Acknowledged Alarm
Alarm Reset
Event
Print
Help
Alarms & Events
Alarm Database
Alarm Dialer
Alarm Acknowledge
Influent
Effluent
Air
Sludge
Alarm
NPW
RAS

June 24, 2015

Node Name: BR1

Operator: operator

Level: 9000

Log On | Log Off

Legend
Site Overview
Influent EQ/Digester
SBR Overview
Operator Setpoints
Effluent Pump Station
SBR1 Trends
SBR2 Trends
Other Trends
Data Extraction
MLSS/SRT Calculations
Run Times/Flow Totals
N.O. LS1 | N.O. LS2
N.O. LS3 | Well House
Dprville LS | Dprville Tank
F.F. LS | F.F. WH
Emerg. Gen. | B.H. WH
System Configuration

Equipment Run Time Summary

6/24/2015 5:07:25 PM

Next Page >>

Print

Description	Units	Today	1 Day	2 Days	3 Days	4 Days	5 Days	6 Days	7 Days	Cumulative
Generator Run Time	hours	0.6	0.0	0.0	0.0	0.0	0.0	0.0	0.6	13.6
Generator Starts		1	0	0	0	0	0	0	1	24
Raw Wastewater Influent Flow Total	gallons	36050	55060	57490	57180	62900	61670	74990	73670	2109940
Raw Wastewater Influent Flow Rate Minimum	gpm	0	0	0	0	0	0	0	0	
Raw Wastewater Influent Flow Rate Maximum	gpm	396	398	401	395	392	395	394	653	
Raw Wastewater Influent Flow Rate Average	gpm	39	40	41	41	45	45	55	52	
Fine Screen Run Time	hours	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.9
Fine Screen Starts		14	34	0	0	0	0	0	0	0
SBR1 Motive Pump Run Time	hours	10.1	16.1	13.9	14.0	14.0	15.0	14.8	14.9	2376.4
SBR1 Motive Pump Starts		13	15	29	29	26	19	16	22	3473
SBR2 Motive Pump Run Time	hours	9.9	15.3	13.9	13.8	13.9	14.7	15.5	14.7	2380.4
SBR2 Motive Pump Starts		10	15	26	27	25	18	12	22	2986
SBR Blower 1 Run Time	hours	2.4	3.4	3.4	3.7	3.8	3.6	3.8	4.0	446.9
SBR Blower 1 Starts		12	19	17	17	18	18	18	18	2363
SBR Blower 2 Run Time	hours	2.6	2.6	0.0	0.0	0.0	0.0	0.0	0.0	427.8
SBR Blower 2 Starts		9	5	0	0	0	0	0	0	2054
SBR Blower 3 Run Time	hours	0.0	3.2	3.0	3.2	2.7	3.3	4.2	3.8	142.0
SBR Blower 3 Starts		0	16	11	16	13	15	16	16	970
Influent EQ 1 Motive Pump Run Time	hours	0.9	1.9	1.2	1.3	1.6	1.7	1.9	1.4	231.7
Influent EQ 1 Motive Pump Starts		18	19	48	55	53	32	20	44	7071
Influent EQ 2 Motive Pump Run Time	hours	1.4	2.7	1.3	1.2	1.2	1.8	1.8	1.6	268.9
Influent EQ 2 Motive Pump Starts		18	19	50	47	48	31	17	43	6590
Influent EQ Blower 1 Run Time	hours	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1
Influent EQ Blower 1 Starts		0	0	0	0	0	0	0	0	3
Influent EQ Blower 2 Run Time	hours	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.1
Influent EQ Blower 2 Starts		0	0	0	0	0	0	0	0	4
Digester Blower Run Time	hours	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Digester Blower Starts		0	0	0	0	0	0	0	0	0
SBR Effluent Flow Total (from flowmeter)	gallons	42910	51930	53250	53590	63920	75330	89530	53230	9263200
SBR Effluent Flow Rate Minimum	gpm	0	0	0	0	0	0	0	0	
SBR Effluent Flow Rate Maximum	gpm	553	561	562	555	570	563	565	554	
SBR Effluent Flow Rate Average	gpm	51	38	39	39	47	55	64	39	
SBR Effluent Flow Total (calculated from level)	gallons	43319	52385	53862	54067	64489	75730	90205	53779	487836

Alarm Acknowledge
Alarms & Events
Alarm Database
Alarm Dialer

Influent
Effluent
Air
Sludge
Alum

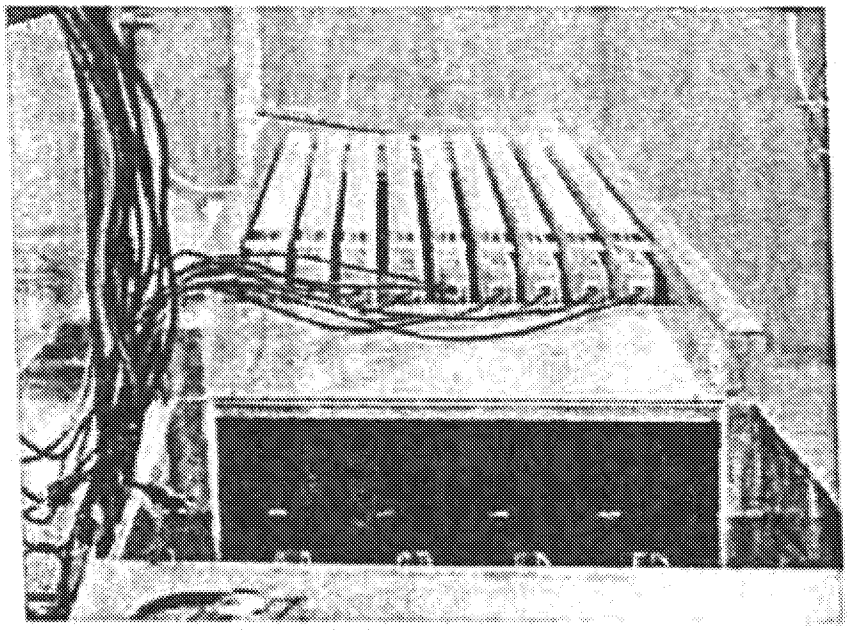
NPW
RAS

DIVISION 600

UV DISINFECTION

DIVISION 600

Ultraviolet Disinfection



610 UV SYSTEM DESCRIPTION

After SBR biological treatment, the wastewater contains a multitude of bacteria, some of which can cause disease in humans including typhoid, fever and dysentery. The reduction of the bacteria remaining after biological treatment is achieved by ultraviolet light disinfection.

The UV disinfection system includes a single stainless steel channel with nine UV modules containing four ultraviolet lamps per module (total 36 lamps). The submerged lamps emit UV radiation that causes rearrangement and damage to the genetic code of microorganisms, preventing them from reproducing. The system is rated to treat a peak process flow of 1.0 MGD (694gpm). The SBR Effluent Decant Flow Rate setpoint is 680 gpm.

To provide UV energy, low-pressure mercury lamps are charged by striking an electric arc. The energy generated by excitation of mercury vapor contained in the lamp results in the emission of UV light. The optimum UV wavelength for germicidal effect is 253.7 nanometers (nm).

The intensity of the UV output is measured in milliwatts per square centimeter (mW/cm^2). The UV output after 1-year is approximately 65 percent of the output after the 100-hour burn-in-period. This output is further reduced to approximately 58 percent at the end of 2 years. A submersible UV sensor is mounted

on one UV lamp to measure the UV intensity. That intensity measurement should be representative of the other 35 lamps.

The UV intensity of a new lamp in clean water with a clean quartz sleeve will be approximately 7 to 9 mW/cm^2.

UV transmittance is reduced by suspended solids in the water, materials coating the quartz sleeve over the UV lamps, and aging of the lamps. The secondary effluent should be kept below 20 mg/L suspended solids. The quartz sleeves should be kept clean. The lamps should be replaced on a scheduled basis. Low intensity alarm is set at 1.6 mW/cm^2.

620 CONTROLS

Power distribution receptacles and power cables feed the modules. The UV modules are controlled by plugging the power cables into the receptacles. The receptacles are energized from the circuit breakers in the Lighting Panel upstairs.

One submersible UV sensor continuously monitors the UV intensity produced in the UV lamp modules. UV intensity in milliwatts per square centimeter (mW/cm^2) is indicated on the Control Panel display (10-LCP-3-1). This display will flash when the intensity drops below the Low UV Intensity Alarm set-point (1.6 mW/cm^2)

630 OPERATION

CAUTION

EXPOSURE TO UV LIGHT CAUSES BURNS TO THE EYES AND SKIN. KEEP ILLUMINATED UV LAMPS SUBMERGED IN SYSTEM CHANNELS. TAKE PRECAUTIONS WHEN WORKING WITH UV LIGHT. ALWAYS WEAR A FACE SHEILD AND COVER EXPOSED SKIN.

******WHEN ENERGIZED, DO NOT LOOK AT ULTRVIOLET LAMPS******

START-UP

1. Inspect the modules:
    a. Ensure sleeves and UV sensor are clean.
    b. Ensure sleeves are not cracked.
    c. Sleeve nuts are hand tight.
    d. Power cable strain-relief on each module is hand tight.
    e. Power cable plugs are clean.

2. Place the modules in the UV channel (may require two people).

3. Confirm that the channel is clean and free from debris. Introduce effluent to the channel and confirm that all lamps are submerged.

4. Energize breakers for power distribution receptacles (PDR). (Circuit breakers # 11, 13, 15, 17, 19, 21 in Lighting Panel 10LP1)

5. Press the TEST button on each PDR to verify ground fault circuit interruption. Press the RESET button to each PDR to re-energize. **Do not plug any module into a PDR that you suspect does not have adequate ground fault circuit interruption protection.**

6. Plug modules into their respective PDRs. Verify the modules are energized by inspecting the lamp-on status LEDs.

7. Plug the UV sensor into receptacle at the base of the Monitor.

8. Wait 15 minutes and ensure that the UV intensity reading on the monitor is acceptable.

NORMAL OPERATION

Operator supervision is minimal. The system is self-operating, except for answering alarms, routine check-up on the system, and bulb cleaning or replacement.

Clean the lamps on a regular basis with LIME-A-WAY when scale deposits are noticed or when the controls indicate the intensity had fallen below 2.8 mW/cm^2. The cleaning frequency is dependent on disinfection requirements and effluent quality. The UV system can remain in service when individual lamp modules are removed for cleaning. Clean the UV sensor with LIME-A-WAY weekly, or on a regular basis.

NOTE: DO NOT SPILL OR SPLATTER LIME-A-WAY. IT CAN BURN HOLES IN CLOTHING CONCRETE, SKIN, etc.

Lamp replacement may be necessary at 8,760-13,500 hours, depending on disinfection requirements and operating parameters.

Inspect the UV channel, Transition Box, and Level Control Weir for debris, sediment, and algae build-up. Clean as necessary.

SHUTDOWN

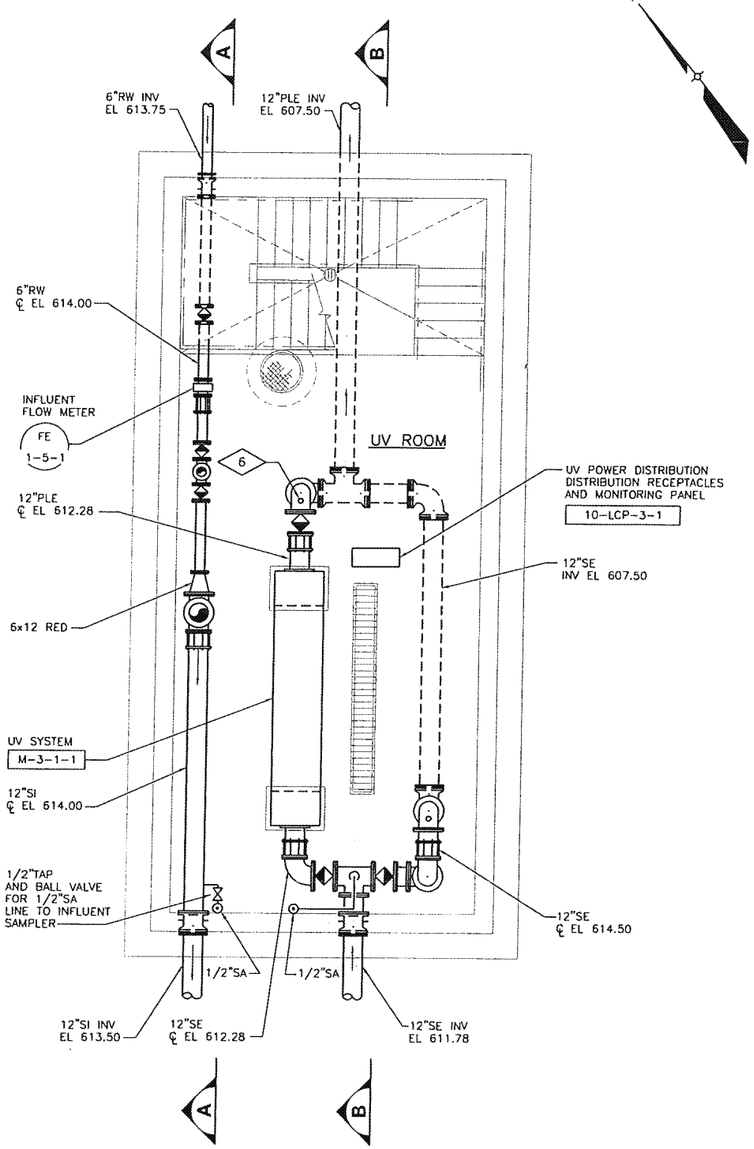
1. Unplug the modules from the PDRs. Unplug UV sensor from base of the Monitor.

2. Remove modules from their channels. Clean sleeves with cleaning pad and water. Keep the modules power cables dry. Then clean with LIME-A-WAY. Spray sleeves to remove residual LIME-A-WAY.

3. If shutting down for winter, store modules in a heated, dry location where sleeves are protected from breakage.

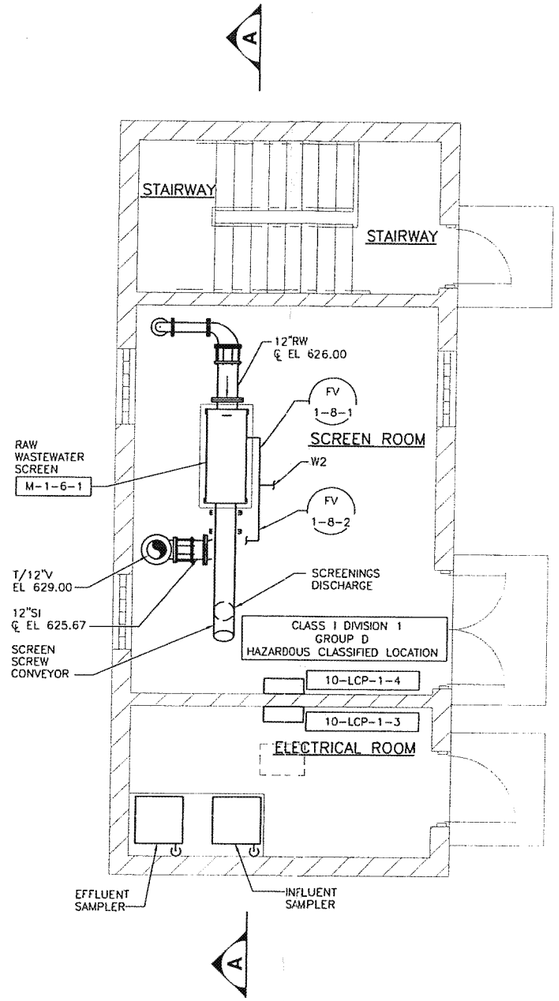
4. De-energize PDR breakers and monitor.

5. Clean UV Channels



BASEMENT PLAN

0' 2' 4' 8'
SCALE



FIRST FLOOR PLAN

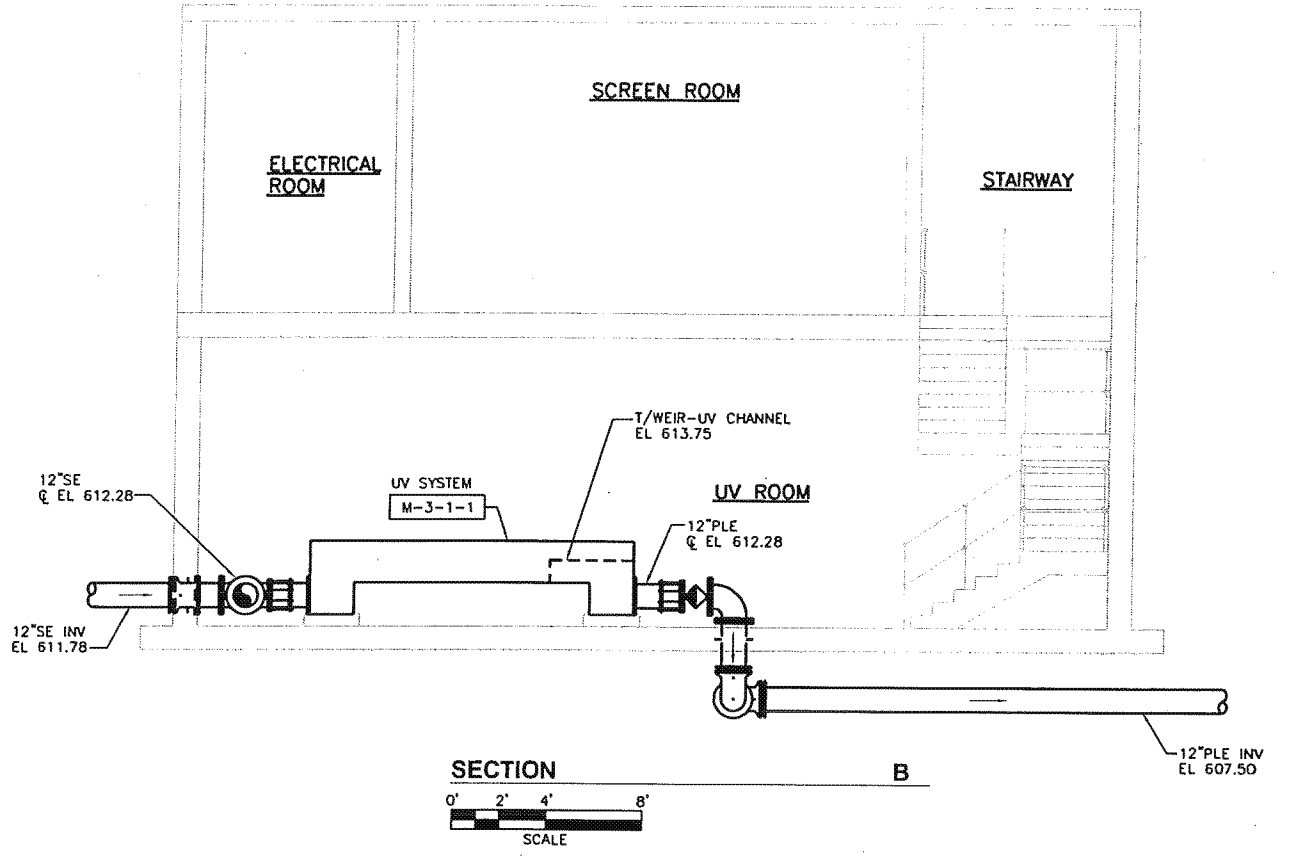
0' 2' 4' 8'
SCALE

EARTH TECH

4135 Technology Parkway • Sheboygan, WI. 53083-1883 • (920) 458-8711

FIGURE
SCREEN / UV BUILDING
PLAN VIEWS

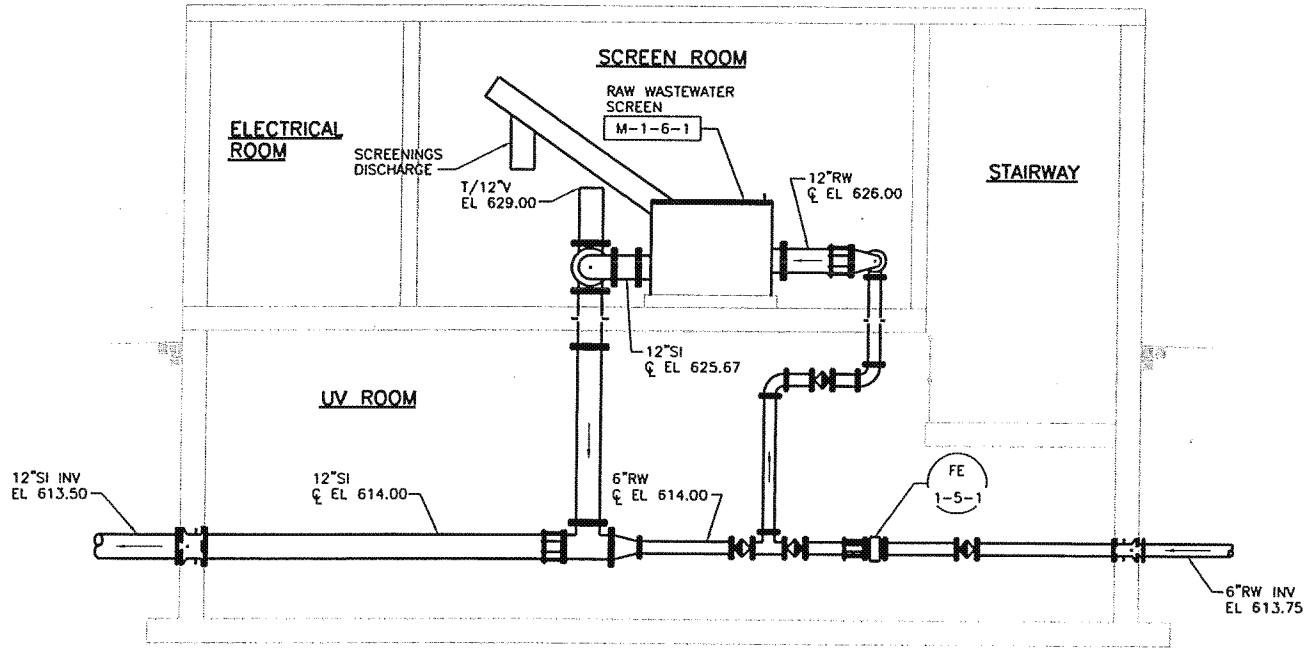
BAD RIVER BAND ODANAH COMMUNITY WWTP



SECTION B

0' 2' 4' 8'

SCALE



SECTION A

0' 2' 4' 8'

SCALE

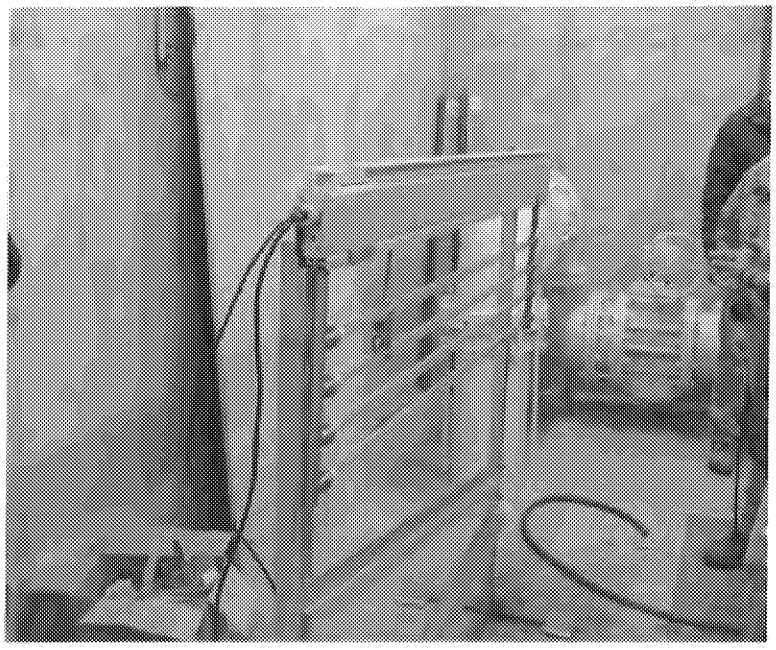
E A R T H T E C H

4135 Technology Parkway • Sheboygan, Wi. 53083-1883 • (920) 458-8711

FIGURE
SCREEN / UV BUILDING SECTION VIEWS

BAD RIVER BAND ODANAH COMMUNITY WWTP

File: L:\WORK\44037\CADD\onm figures\10M2.dwg Time: Apr 26, 2002 - 12:46pm



Sensor on lamp #2

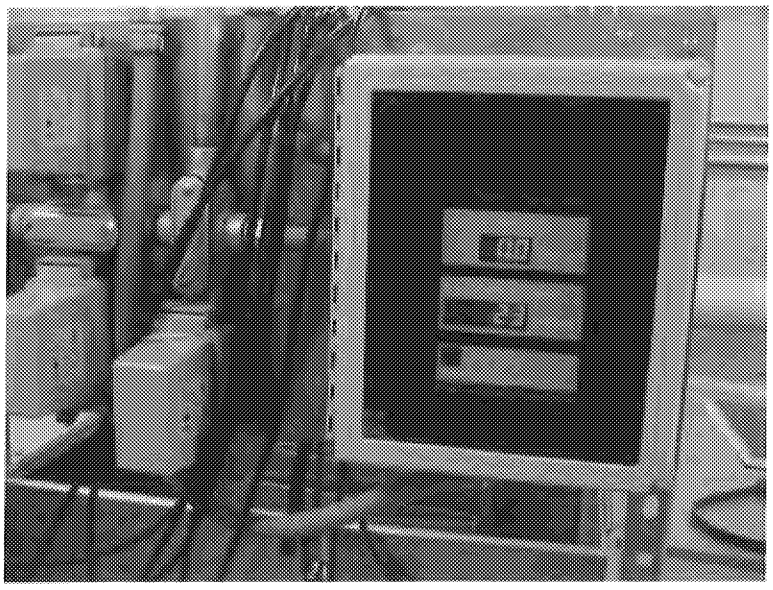
The UV intensity of a new lamp in clean water with a clean quartz sleeve will be approximately 7 to 9 mW/sq.cm.

UV transmittance is reduced by suspended solids in the water, materials coating the quartz sleeve over the UV lamps, and aging of the lamp. The secondary effluent should be kept below 20 mg/L suspended solids. The quartz sleeves should be kept clean. The lamps should be replaced on a scheduled basis. A low intensity alarm is set at 1.6 mW/sq.cm.

620 CONTROLS

Power distribution receptacles and power cables feed the modules. The UV modules are controlled by plugging the power cables into the receptacles. The receptacles are energized from the circuit breakers in the Lighting Panel upstairs.

One submersible UV sensor continuously monitors the UV intensity produced in the UV lamp modules. UV intensity in milliwatt per square centimeter (mW/sq.cm) is indicated on the Control Panel display (10-LCP-3-1). This display will flash when the intensity drops below the Low UV Intensity Alarm setpoint (1.6 mW/sq.cm.).



Elapsed time in hours is indicated on a display. The elapsed time will flash when the display reading is between 9,500 – 10,000 hours, and it will also flash for each period of 10,000 hours following the 9,500 hour mark; i.e. 9,500 – 10,000 hours, 19,500 – 20,000 hours, 29,500 – 30,000 hours, etc. The flashing period indicates the lamps will need to be changed in the near future. When the display reaches 65,535 hours, the hour counter will automatically reset to 0 hours.

630 OPERATION

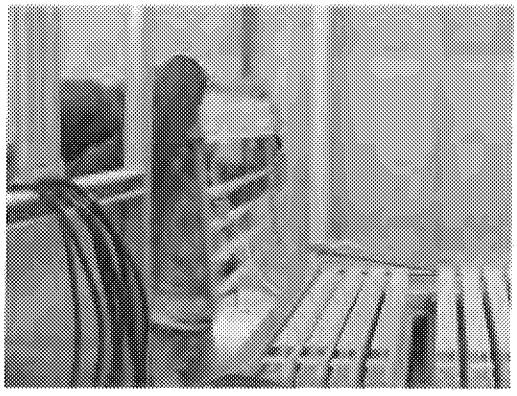
CAUTION

Exposure to UV light causes burns to the eyes and skin. Keep illuminated UV lamps submerged in system channel. Take precautions when working with UV light be wearing a face shield and covering exposed skin. WHEN ENERGIZED, DO NOT LOOK AT ULTRAVIOLET LAMPS

Startup

1. Inspect the modules: 1) sleeves and UV sensor are clean; 2) sleeves are not cracked; 3) sleeve nuts are hand-tight; 4) module power cable strain-relief on each module is hand-tight; 5) module power cable plugs are clean.

2. Place the modules in the UV channel (may require two people).



3. Confirm that the channel is clean and free of debris. Introduce effluent to the channel and confirm that all lamps are submerged.

4. Energize breakers for power distribution receptacles (PDR). (Circuit breakers #11, 13, 15, 17, 19, 21 in Lighting Panel 10LP1)

5. Press the test button on each PDR to verify ground fault circuit interruption. Press the RESET button on each PDR to re-energize. **Do not plug any modules into a PDR that you suspect does not have adequate ground fault circuit interruption protection.**

6. Plug the modules into their respective PDRs. Verify the modules are energized by inspecting the lamp status LEDs.

7. Plug the UV sensor into receptacle at the base of the Monitor.

8. Wait for 15 minutes and ensure that the UV intensity reading on the Monitor is OK.

9. Call Trojan Technologies Technical Support Centre at (800) 666-9459 with any questions.

Normal Operation

Operator supervision is minimal. Along with answering alarms, routine check-up on the system, bulb replacement or cleaning, the system is self-operating.

Clean the lamps on a regular basis with Lime-A-Way when scale deposits are noticed or when the controls indicate an intensity falls below 2.8 mW/sq.cm. The cleaning frequency is dependent on disinfection requirements and effluent quality. The UV system can remain in service when individual lamp modules are removed for cleaning. Clean the UV sensor with Lime-A-Way weekly, or on a regular basis.

NOTE: DO NOT SPILL OR SPLATTER LIME-A-WAY. It eats holes in clothes, boots, concrete, skin, etc.

Lamp replacement may be necessary at 8,760 – 13,500 hours, depending on disinfection requirements and operating parameters.

Inspect the UV channel, Transition Box, and Level Control Weir for debris, sediment, and algae build-up. Clean when necessary.

Shutdown

1. Unplug the modules from the PDRs. Unplug UV sensor from base of Monitor.

2. Remove modules from channel. Clean sleeves with cleaning pad and water. Keep module power cable dry. Then clean with Lime-A-Way. Spray sleeves to remove residual Lime-A-Way.

3. If shutting down for winter, store modules in a heated, dry location where sleeves are protected fro breakage.

4. De-energize PDR breakers and Monitor.

5. Clean UV channel.

DIVISION 700

EFFLUENT PUMP STATION AND FORCE MAIN

DIVISION 700

Effluent Pump Station & Force Main

710 DESCRIPTION OF EFFLUENT PUMP STATION

Following UV disinfection, plant effluent flows by gravity to the Effluent Pump Station. All plant effluent enters the Wet Well for pumping through the Final Effluent Force Main to be discharged in the Bad River.

The operators select each pump to be LEAD or LAG, or for the two pumps to automatically alternate being LEAD and LAG.

FINAL EFFLUENT SUBMERSIBLE PUMPS	
Equipment number	P-5-1-1 & P-5-1-2
Manufacturer	ABS
Pump size	6”
Capacity	800 gpm @ 54’ head
Constant speed	1780 rpm
Motor horsepower	17.4
Motor Speed	1780 rpm
Volts/amps/phases	460/23.2/3

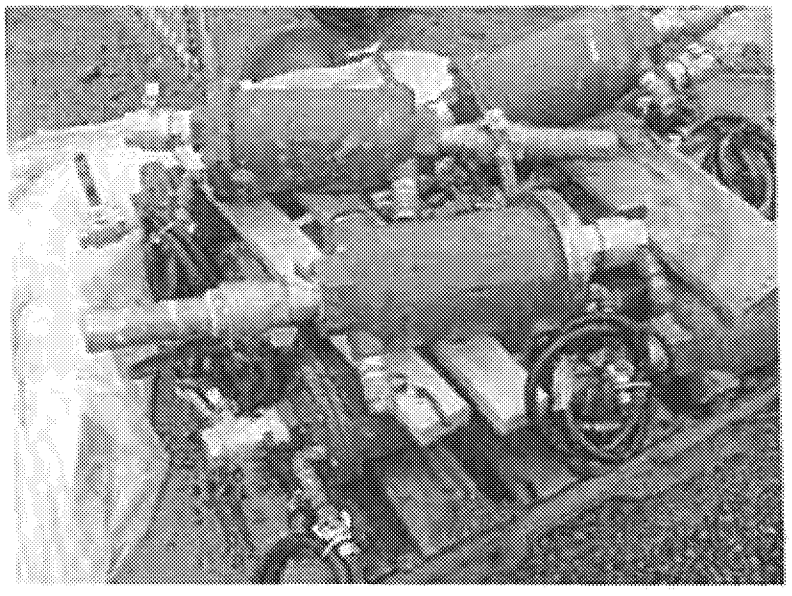
There is a submersible level transducer (LE/LIT-5-2-1) in the lift station that measures the liquid level. It has a range of 0 to 10 feet. The liquid level controls the operation of the pumps. The base of the lift station is elevation 598.0 feet.

LAG pump on	8.0 feet
LEAD pump on	7.0 feet
LAG pump off	4.0 feet
LEAD pump off	3.0 feet

A high level float switch (LSHH-5-3-1) is mounted at 9.0 feet. A low level float switch (LSLL-5-3-1) is mounted at 2.5 feet.

The pumped plant effluent flows through approximately two miles of 10-inch force main before discharging into the Bad River.

There are 9 manholes along the length of the force main that have combination air release and vacuum valves.



AIR RELEASE/VACUUM VALVES

720 EFFLUENT PUMP STATION CONTROLS

The pumps are controlled from Lift Station No. 1 Control Panel – 50-LCP-5-1.

The main control devices on the Control Panel include:

- HAND-OFF-AUTO switch for each pump (outer panel door)
- 1-2/2-1/ALT selector switch (inner panel door)
- LEAD and LAG pump start/stop levels (inner panel door)

In HAND a pump will run continuously. In OFF a pump is prevented from running. In AUTO a pump will start and stop according to the liquid level control points and the selector switch position.

If "1-2" is selected, pump #1 is LEAD and pump #2 is LAG. If "2-1" is selected, pump #2 is LEAD and pump #1 is LAG. If "ALT" is selected the pumps will automatically alternate LEAD and LAG designation each time they are called to run. If a pump failure occurs, the respective RESET button must be manually pushed in order to reset the failure.

If the level in the lift station rises above the high-level float or drops below the low-level float, the Lift Station No.1 Control Panel will enter "Backup Mode".

- If the high level float switch is reached, Backup mode will call for the LEAD pump to run.
- If the high level float is still tripped after _minutes, the LAG pump will be called to start.
- On decreasing level, when low level float switch is reach, the LEAD pump will stop.
- If the low level float is still tripped after _minutes, the LAG pump will be called to stop.
- Pressing BACKUP RESET button will return the pumps to normal control under the pressure transducer signals.

There is a MANUAL LEVEL SIMULATOR on the inner control panel door, to artificially run the liquid levels up or down to test operation signals to pumps.

730 EFFLUENT PUMP STATION OPERATIONS

Normal Lift Station operation is accomplished by:

- Switching the "1-2/2-1/ALT" selector switch to "ALT"
- Placing the control switch for each pump in AUTO

The pumps will automatically start and stop in accordance with the liquid levels in the lift station, and will alternate LEAD and LAG roles. The operators may adjust the LEAD and LAG pump start and stop levels at the control panel inner door by pulling and replacing the pegs.

If a pump must be taken out of service, turn its selector switch to OFF. Turn the pump's electrical disconnect switch on the motor control center to the OFF position. Lockout/Tagout (LOTO) the electrical disconnect switch, if appropriate.

DIVISION 800

ALUM FEED SYSTEM

DIVISION 800

Alum Feed System

810 CHEMICAL PHOPHORUS REMOVAL DESCRIPTION

Although phosphorus must be present in the activated sludge process for proper microbial growth, an excess of phosphorus that remains after microbial utilization must be removed. Discharge of excess phosphorus to a receiving body of water from a wastewater treatment plant can result in over-fertilization of the receiving water in which nuisance growth of algae and aquatic weeds occur.

The SBR biologically removes phosphorus as the primary method of removal. The alum feed system is a backup phosphorous removal system, and is to be used only in the event the biological removal system is insufficient. Alum precipitates the phosphorus out of solution for removal. An insoluble aluminum phosphate is formed from this reaction and settles in the SBRs during the SETTLING phase of the SBR sequence, or in the AEROBIC DIGESTER.

Alum Characteristics	
Solution Concentration $Al_2(SO_4)3*14H_2O$	48%
Specific Weight of Solution	1.33
Solution Weight	11.1 lbs/gal.
Alum Weight in Solution	5.33 lbs/gal.
Design dose, gallons of solution per lb P removed	3.59
Alum feed rate at Design Average daily loading	4 gpd

The alum feed system is located in the Equipment Building in the SBR Bower Room. The system includes:

- Alum catch basin/stand
- Two diaphragm feed pumps – capacity 0.01 to 1.0 gallons per hour

The alum is pumped from the drums to either of two points:

1. The Influent EQ Motive Pump discharge pipe – prior to the SBRs.
2. The Waste Sludge pipe – before the Aerobic Digester.

820 CHEMICAL PUMP OPERATION

The alum feed pumps will be automatically called to run. The speed control of the pumps can be manually adjusted. Equipment includes:

- Power cords plug into a switched 120 VAC receptacle
- Speed Knob – used to set number of strokes per minute. Turning this knob completely counter-clockwise will manually shut off the pump.
- Stroke Knob – used to set percent of maximum stroke length. The stroke length adjustment changes the length of the diaphragm stroke of the pump. The longer the stroke, the more gallons per hour of alum is pumped. Conversely the shorter the stroke, the fewer gallons per hour are pumped.
- Top of discharge head – black knob and yellow knob. During pump startup, turn black knob to divert flow from normal discharge line to return line into the alum drum to help prime the pump. Pull yellow knob to release pressure.

830 ALUM FEED SYSTEM OPERATION

To place the alum feed system into operation:

1. Pump suction tube should go straight down from pump into the drum.
2. Confirm there is sufficient alum in the drum.
3. Plug the pump in to an outlet that is hot and turn the speed knob to ON – the pump should run.
4. While pump is running, set Speed Knob at 80% and stroke Knob to 100%.
5. The suction tubing should begin to fill with alum solution. When the solution starts to discharge out the pump, turn the pump OFF using the speed knob. The pump is now primed. If priming the pump is a problem, turn the black knob on top of the discharge harder to return flow to the alum drum. Release pressure by pulling the yellow knob.
6. Adjust pump output according to the following calculation:

MAX OUTPUT = 24 GPD

PUMP OUTPUT = 24 GPD x %SPEED x %STROKE

7. Determine desired pump output, and then calculate %SPEED and %STROKE. Plug the pump in to the switched outlet and set %SPEED and %STROKE.

8. NORMALLY, set the stroke Length knob at 50%. Set the speed knob at about 30%. Make minor adjustments with the Speed knob.

9. Calibrate pump output. Once the approximate output has been determined as described in #7 above, the pump should be calibrated to adjust speed and stroke for actual desired output. Calibrate by pumping alum into a graduated cylinder. Start pump and stopwatch, and count pump strokes. Calculate output in your choice of units (Minutes, Hours and Days). If output is too low or too high, adjust speed and/or stroke and repeat the procedure.

The switched outlet is controlled by the SBR Control Panel (40-LCP-2-1). Each outlet on the duplex receptacle is controlled independently. The top outlet is powered on when influent is being transferred from either Influent EQ Basin to either SBR. The pump that sends alum to the secondary influent pipe should be plugged in to this outlet.

The bottom outlet is powered on when waste sludge is being pumped from either SBR to the Digester. The pump that sends alum to the waste sludge pipe should be plugged in to this outlet.

To optimize the dosage rate of the alum solution, the plant should routinely preform Total Phosphorous analysis. Total Phosphorous testing should be conducted on a secondary influent wastewater flowing to the SBRs as well as on the final effluent. By knowing the secondary influent wastewater concentration, as well as the final effluent phosphorous concentration, the operator will know how well biological phosphorous removal is working, and can determine if alum-phosphorous precipitation is necessary. For the best results, bench or jar testing with a Phipps and Bird Stirrer for optimum dosage rates is recommended.

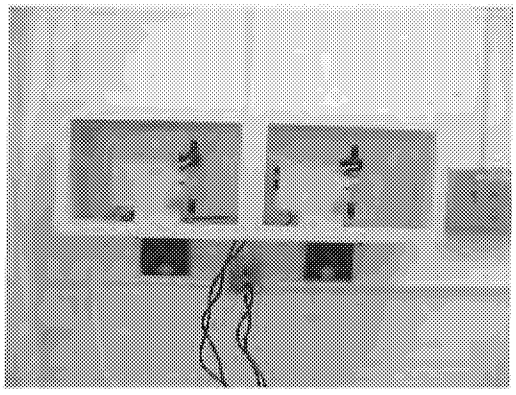
DIVISION 800

ALUM FEED SYSTEM

LIST OF FIGURES

DIVISION 800

ALUM FEED SYSTEM



810 CHEMICAL PHOPHORUS REMOVAL DESCRIPTION

Although phosphorus must be present in the activated sludge process for proper microbial growth, an excess of phosphorus remaining after microbial utilization must be removed. Excess discharges of phosphorus to a receiving body of water from a wastewater treatment plant can result in over-fertilization of the receiving water in which nuisance growths of algae and aquatic weeds occur.

The Sequencing Batch Reactors remove phosphorus biologically as the primary method of removal. The alum feed system is a backup – to be used in the event the biological removal system is insufficient. Alum precipitates the phosphorus out of solution for removal. An insoluble aluminum phosphate is formed from this reaction and settles in the SBRs during the settling phase of the SBR sequence, or in the Aerobic Digester.

Alum Characteristics	
Solution Concentration Al2(SO4)3*14H2O	48%
Specific Wt of solution	1.33
Solution Wt	11.1 lb/gal
Alum Wt in solution	5.33 lb/gal
Design dose, gallons of Solution per lb P removed	3.59
Alum feed rate, Design Average daily loading	4 gpd

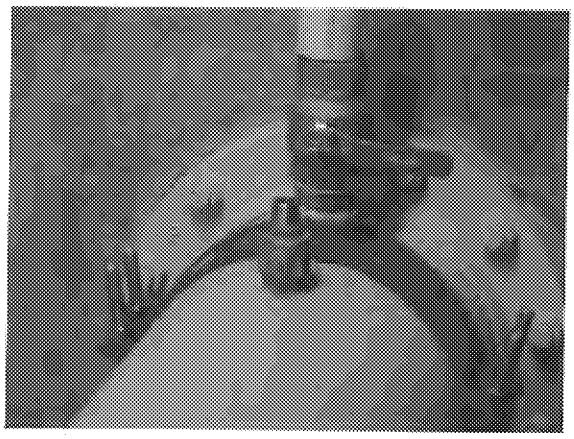
The alum feed system is located in the Equipment Building in the SBR Blower Room. The system includes:

- Alum catch basin/stand
- Two diaphragm feed pumps – capacity 0.01 to 1.0 gallons per hour

The alum is pumped from the drums to either of two points:

1. the secondary influent pipe – before the EQ Basin Isolation Valve and EQ Basin feed pipes.
2. the WAS pipe – before the Aerobic Digester.

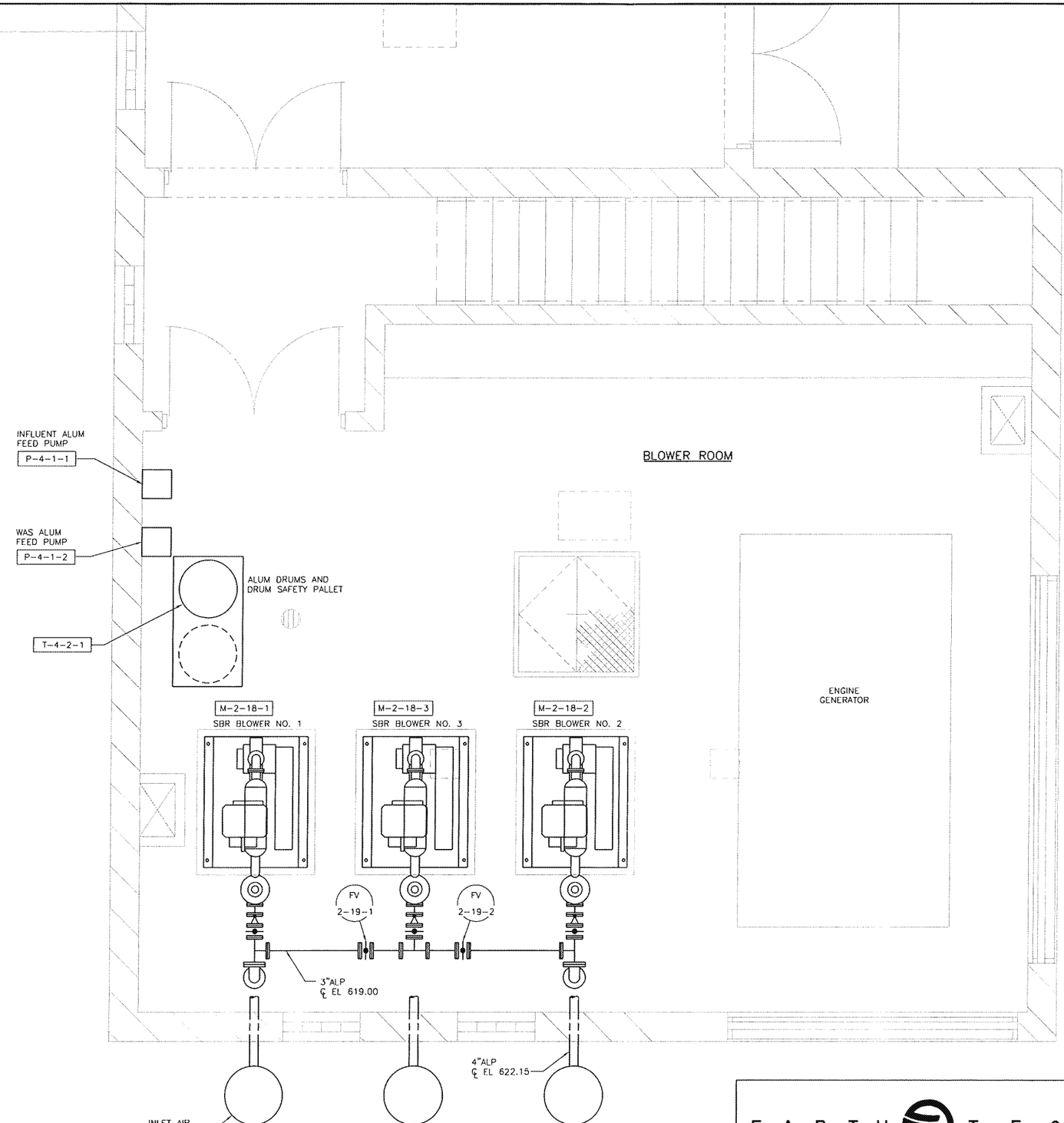
Figure-Equipment Building Basement Plan shows the alum feed point on the secondary influent pipe, and the alum feed point on the WAS pipe. Figure-Equipment Building First Floor Plan shows the location of the alum drums and pumps.



820 ALUM FEED SYSTEM CONTROLS

The alum feed pumps are manually controlled and adjusted. Pump mounted controls allow the manual operation of the pumps. There is:

- Power cord plugs into 110 V receptacle
- Speed Knob, is ON/OFF switch and set percent of maximum strokes per minute
- Stroke Knob, set percent of maximum stroke length. The stroke-length adjustment changes the length of diaphragm stroke of the pump. The longer the stroke, the more volume (gallons per hour) of alum is obtained. Conversely, the shorter the stroke, the less volume obtained.
- Top of discharge head – black knob and yellow knob. During pump startup, turn black knob to divert flow from normal discharge line to return line into the alum drum to help prime pump. Pull yellow knob to release pressure.



FIRST FLOOR PLAN

0' 2' 4'
SCALE

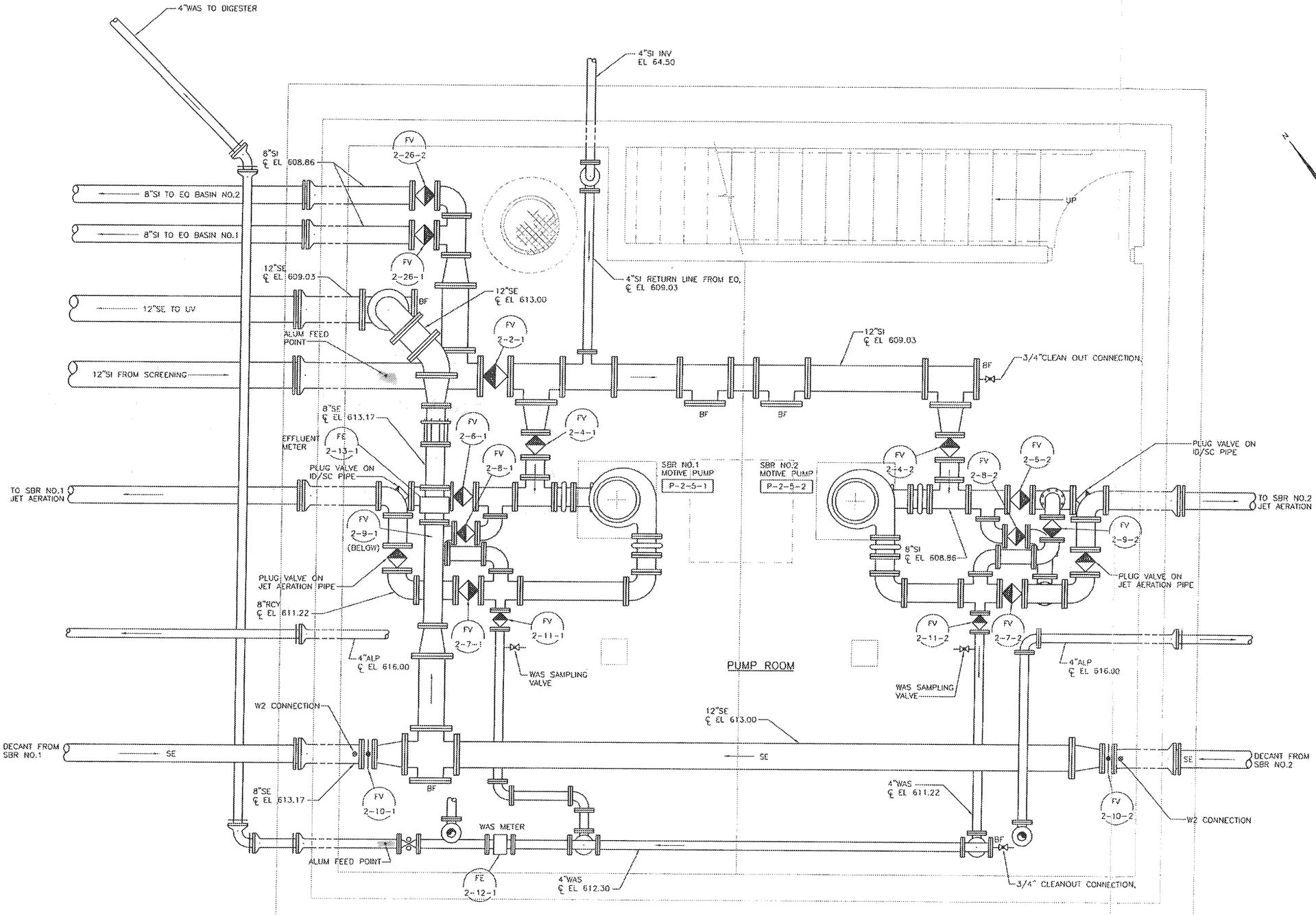
E A R T H T E C H

4135 Technology Parkway • Sheboygan, WI 53083-1883 • (920) 458-8711

FIGURE
EQUIPMENT BUILDING FIRST FLOOR PLAN

BAD RIVER BAND ODANAH COMMUNITY WWTP

File: L:\WORK\44037\CADD\onm figures\45M2.dwg Time: Apr 26, 2002 - 12:49pm



BASEMENT PLAN

0' 2' 4'

SCALE

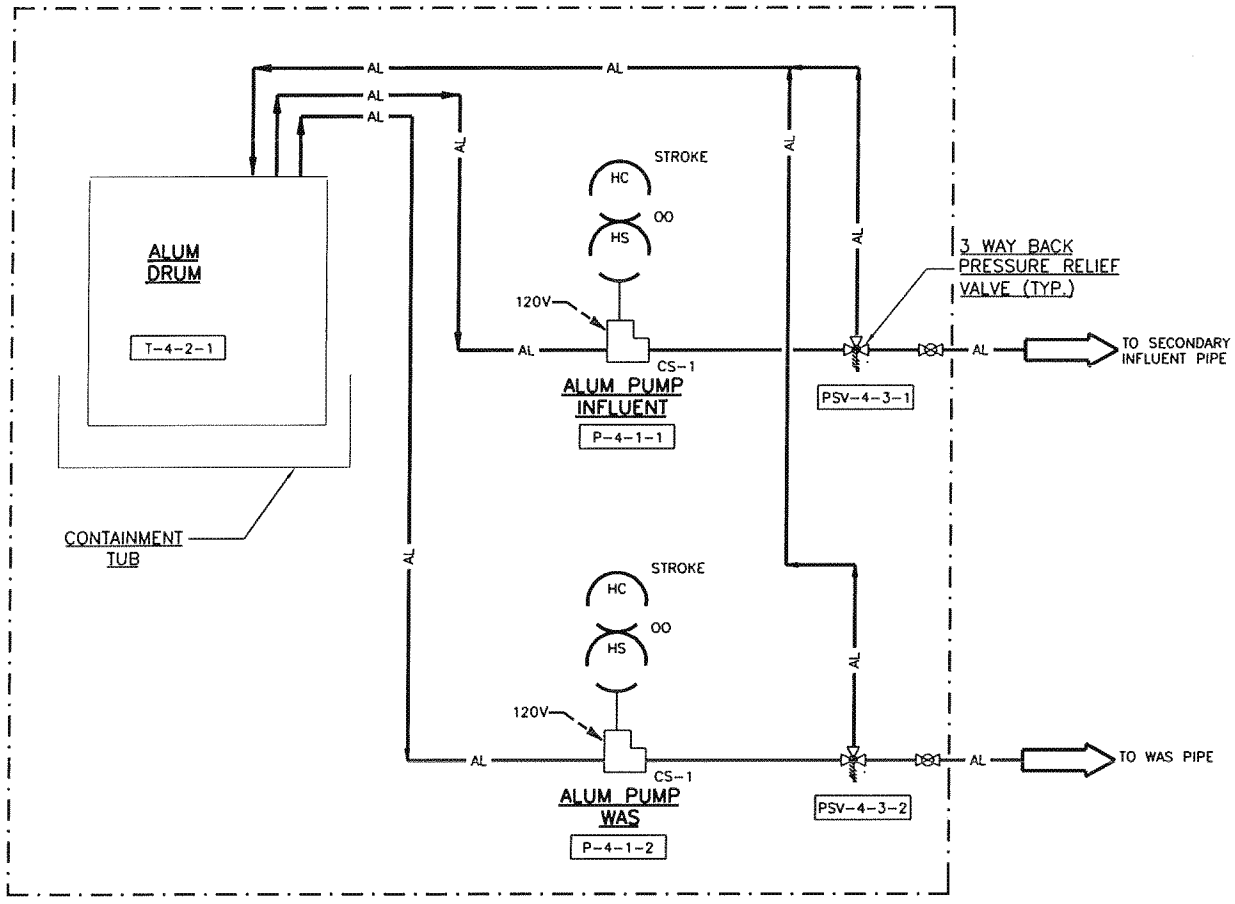
EARTH TECH

4135 Technology Parkway • Sheboygan, WI 53083-1883 • (920) 458-8711

FIGURE
EQUIPMENT BUILDING
BASEMENT PLAN

BAD RIVER BAND ODANAH COMMUNITY WWTP

File: L:\WORK\44037\CADD\anm figures\45M1.dwg Time: Apr 26, 2002 - 12:51pm



ALUM SYSTEM

File: L:\WORK\44037\CADD\anm figures\09n06a.dwg Time: Apr 26, 2002 - 8:39am

E A R T H T E C H

4135 Technology Parkway • Sheboygan, WI. 53083-1883 • (920) 458-8711

DIAGRAM
ALUM FEED

BAD RIVER BAND ODANAH COMMUNITY WWTP

Diagram-Alum Feed shows a schematic of the alum pump system.

830 ALUM FEED SYSTEM OPERATION

To place the alum feed system into operation:

1. Suction tube should go straight down from pump into alum drum.

2. Confirm there is sufficient alum in the drum.

3. Plug in the pump. Turn the Speed Knob to ON – it should run.

4. While pump is running, set Speed Knob at 80% and Stroke Knob at 100%.

5. The suction tubing should begin to fill with alum solution. When solution starts to discharge out the pump, turn the pump off. The pump is now primed. If priming the pump is a problem, turn the black knob on top of the discharge header to return flow to the alum drum. Release pressure by pulling the yellow knob.

6. Adjust pump output. MAX OUTPUT = 24 GPD. PUMP OUTPUT = 24 GPD x %SPEED x %STROKE. Determine desired pump output, then calculate %SPEED and %STROKE. Plug in pump to run, and set %SPEED and %STROKE.

7. NORMALLY, set the Stroke Length knob at 50%. Set the Speed knob at about 30%. Make minor adjustments with the Speed knob.

8. Calibrate pump output. Once the approximate output has been determine as described in #8 above, the pump should be calibrated to adjust speed and stroke for actual desired output. Calibrate by pumping alum into a graduated cylinder. Start pump and stopwatch, and count pump strokes. Turn pump off – note the time and the number of strokes. Calculate output in your choice of units (minutes, hours, day). If output is too low or high, adjust speed and/or stroke and repeat the procedure.

If alum feed is continued for an extended period of time, alternate the two pumps to evenly distribute operating time between them.

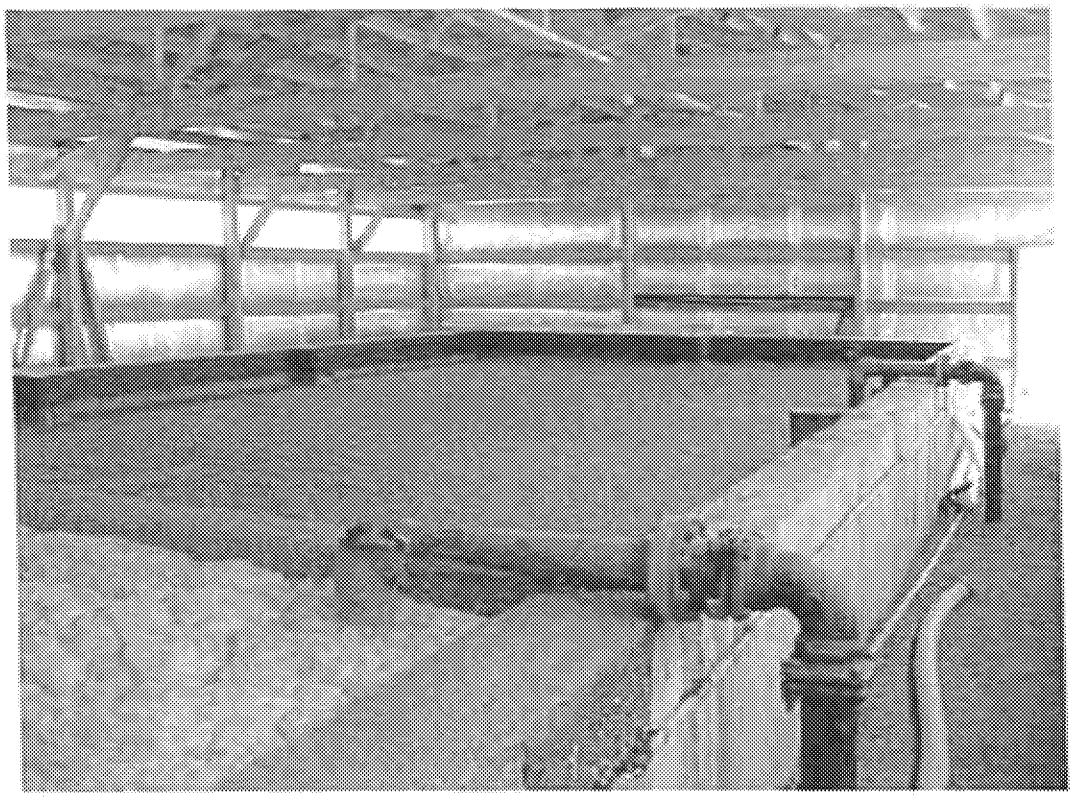
To optimize the dosage rate of the alum solution, the plant should routinely perform Total Phosphorous analysis. Total Phosphorous testing should be conducted on the secondary influent wastewater flowing to the SBRs as well as on the final effluent. By knowing the secondary influent wastewater phosphorous concentration, as well as the final effluent phosphorous concentration, the operator will know how well biological phosphorous removal is working, and can determine if alum-phosphorous precipitation is necessary. For best results, bench or jar testing with a Phipps and Bird Stirrer for optimum dosage rates is recommended.

DIVISION 900

AEROBIC DIGESTION

DIVISION 900

Aerobic Digestion



A portion of the settled activated sludge in the SBR units must occasionally be removed periodically to keep the SBR solids inventory at an appropriate level. This Waste Activated Sludge (WAS) is pumped by the SBR Motive Pumps to the Aerobic Digester.

Biologically active WAS must be stabilized prior to its release to the environment. The aerobic digester process is characteristic of the activated sludge process because organic matter (WAS) is aerobically digested by a biological population. As the supply of available substrate (food) is depleted, the microorganisms (microbes) begin to consume their own protoplasm to obtain energy for cell-maintenance reactions – this is referred to as the endogenous phase. Aerobic digestion differs from activated sludge because the process of return activated sludge (RAS) and continuous feed (secondary influent) to the microbe population is eliminated. With this in mind, aerobic digestion is then based on the process of endogenous respiration described above.

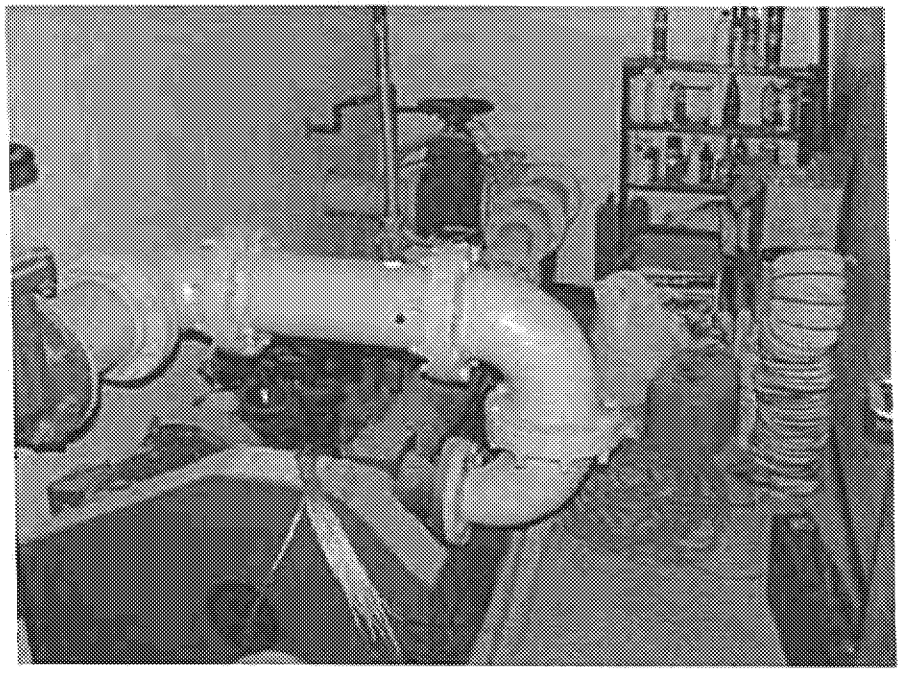
A proper environment must be maintained for the aerobic digestion process to thrive – oxygen, pH (sufficient Alkalinity), time and temperature being priority considerations. The overall objective of the aerobic digestion process is the biological oxidation of volatile suspended solids (VSS) which are biodegradable organics, with the intent of producing a stable, condensed, and disposable sludge.

The WAS will undergo aerobic digestion for 20 to 60 days. After a period of quiescent conditions in the Aerobic Digester, the sludge and water separate forming a concentrated sludge blanket at the bottom of the digester and an overlying supernatant. The supernatant can be decanted to EQ Basin #1 or #2. Digested sludge is pumped to a lagoon.

910 DESCRIPTION

The aerobic digestion process at the Odanah Community WWTP includes:

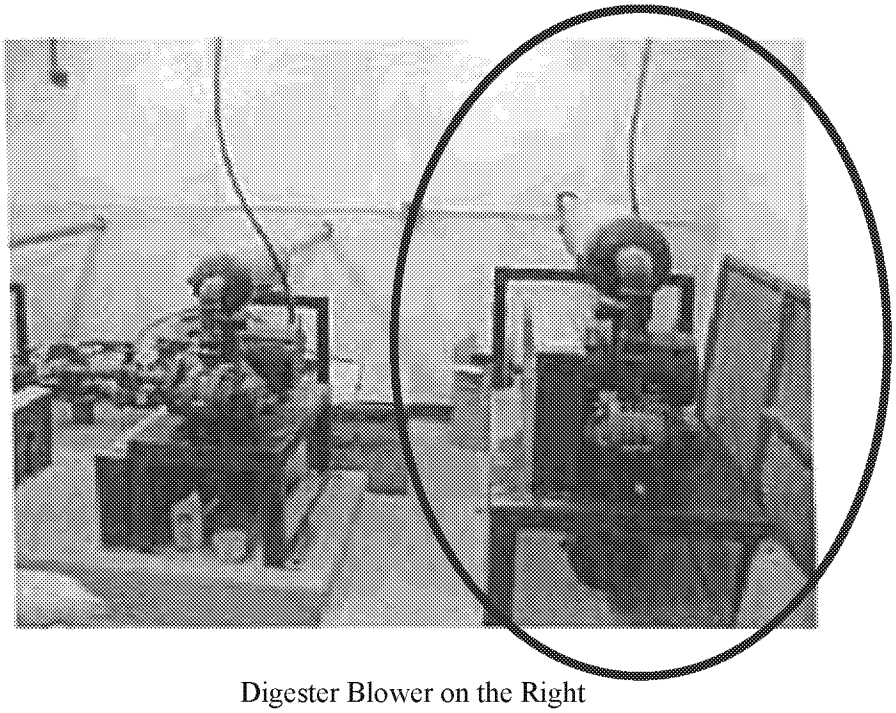
- AEROBIC DIGESTER TANK, Volume = 88,600 gallons
- COARSE BUBBLE DIFFUSION
- 1 - POSITIVE DISPLACEMENT BLOWER (M-2-23-1) capacity = 250 scfm
- FLOATING DECANTER to remove supernatant
- SLUDGE WITHDRAW PUMP



The Digester Tank is equipped with a level sensor (LIT-2-28-1). This is a submersible pressure transducer for liquid level indication. Its range is 1 -18 feet. The same type of level sensor is used in each SBR and each Influent EQ Tank. A high level float switch (LSH-2-29-1) is mounted at _feet.

The SBR Motive Pump pumps the WAS into the Aerobic Digester periodically (see SBR, Division 500).

Positive Displacement rotary blower (M-2-23-1) supplies air to the Digester at approximately 250 scfm. The air is distributed through coarse bubble air diffusers. The air supplied to the digester is needed by the microbes that feed on the organic matter (WAS) and it helps mix the contents of the basin. The positive displacement blower operates intermittently to maintain sufficient dissolved oxygen levels in the sludge.



Digester Blower on the Right

The Digester Blower is located in the Utility Building. The blower is controlled from the SBR Control Panel (40-LCP-2-1).

920 CONTROLS

There are controls for:

- AEROBIC DIGESTER BLOWER
- DIGESTER SLUDGE PUMP

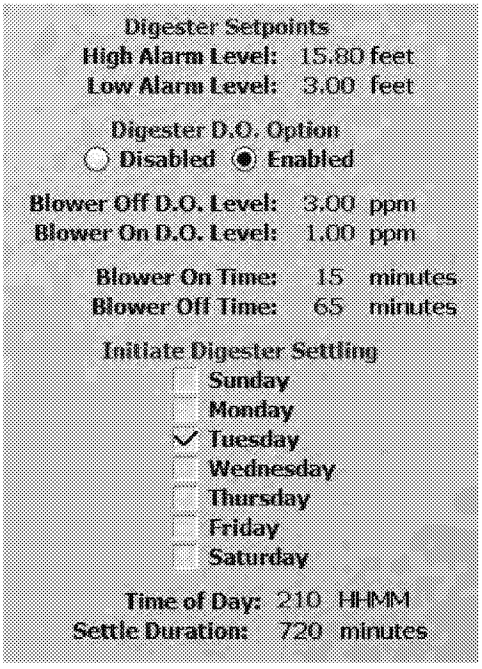
Aerobic Digester Blower: The Digester Blower is controlled from a HAND-OFF-AUTO selector switch on the SBR Control Panel (40-LCP-2-1). In HAND the blower will run continuously. In OFF the blower is prevented from running. In AUTO the blower is controlled by the SBR PLC based on the following setpoints which are accessible from the two SCADA computers:

> **Blower On Time/Blower Off Time** – The Digester Blower will be called to run on a time on/time off basis. The Blower will be called to run for the number of

minutes in the **Blower On Time** setpoint. When that time has expired, the blower will be turned off and remain off for the number of minutes in the **Blower Off Time** setpoint. When that time has expired the blower will be called to run again.

Digester D.O. Option – If the **Digester D.O. Option** is set to Disabled then the Digester Blower will be called to run only on a time on/time off basis. If the **Digester D.O. Option** is set to Enabled then the Digester Blower will also be called to run or not run based on the D.O. level in the Digester as well as time.

Blower On D.O. Level/Blower Off D.O. Level – If the **Digester D.O. Option** is set to Enabled, then the Blower will be called to run until the D.O. level rises above the **Blower Off D.O. Level** setpoint. At that point, the blower will go off and remain off until the D.O. in the Digester has dropped below the **Blower On D.O. Level** setpoint, at which point the blower will be called to run again.



High Alarm Level/Low Alarm Level – If the level in the Digester rises above the **High Alarm Level** setpoint a High-Level Alarm will be generated and displayed on SCADA. If the level in the Digester drops below the **Low Alarm Level** setpoint a Low-Level Alarm will be generated and displayed on SCADA. If either alarm is active, the Digester Blower will not be called to run in automatic regardless of the D.O. level.

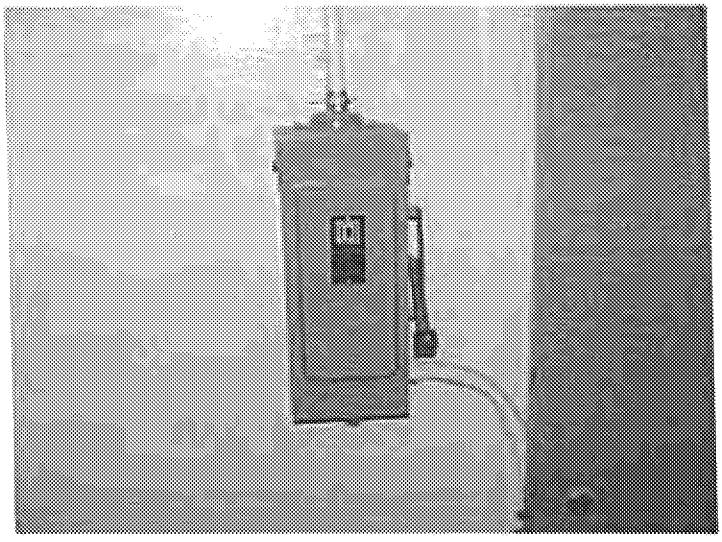
Initiate Digester Settling – The operator has the ability to select which days of the week to initiate a Settle step in the Digester. During the Settle step, the blower will not be called to run. This will allow the Digester to settle in preparation for Decanting. Clicking the box next to a day will cause the Digester to enter a Settle step on that day at the time specified in the **Time of Day** setpoint.

Time of Day – This setpoint determines the time of day that the Settle step will be initiated. This setpoint must be entered in military time format with no decimal points. Example: 3:30 p.m. would be entered as 1530.

Settle Duration – This setpoints determines the number of minutes that the Digester will remain in the Settle step before returning to the aeration cycles described above.

Digester Sludge Pump: The controls include manually operated valves on the suction side and discharge side of the pump. THESE VALVES MUST BE OPEN BEFORE THE PUMP CAN RUN. Close the valves after digested sludge has been transferred to the lagoon.

The pump is turned on by manually switching the circuit disconnect switch from OFF to ON.



930 OPERATION

Before placing the aerobic digester and associated equipment into operation be sure to follow these steps:

1. Check the condition, rotation and operability of the blower.
2. Check the position of all manual valves.
3. Make sure the decant valve is closed.
4. Conduct wet test on diffuser system.
    a. Start blower and observe air flow though diffuser system. Replace any malfunctioning diffusers before filling digester with WAS.
5. Start up the digester blower
    a. Place the HAND/OFF/AUTO switch in AUTO. Enter setpoints for Blower On Time and Blower Off Time. The Blower will start and stop based on these setpoints.

When the above steps have been taken, WAS pumping can begin.

The blower will normally run (for example) 30 minutes every hour if DO is not enabled. If DO is enabled the blower will start when the DO has dropped to 1 mg/L and stop when DO has risen to 3 mg/L.

The digester sludge will regularly be pumped to tanker truck for disposal. Supernatant decanting will be done with the manual decant valve. During Decant, the operator must visually inspect the condition of the supernatant for carry over solids. Stop the Decant when supernatant solids become excessive.

Operators should check the operation of the aerobic digester at least twice per shift. Observe the aeration pattern at the tank surface for possible plugging. Areas of reduced mixing may indicate plugging or insufficient air supply. If the diffusers are plugged, they must be cleaned.

As the supply of available food (WAS) is depleted, the microbes begin to consume their own protoplasm to obtain energy for cell maintenance reactions. When this occurs, the microbes are said to be in an **endogenous state.** The microbe's cell tissue is aerobically oxidized to carbon dioxide, water and ammonia. The ammonia from this oxidation is subsequently oxidized to nitrate (NO3) which, when combined with water can lower the digester pH. The pH should be close to neutral (7.0 +/- 0.5) pH units, for the microbes to thrive in the digestion process. The pH should be checked once per shift. Accompanying the pH test should be an Alkalinity test of the raw wastewater.

DIVISION 1000

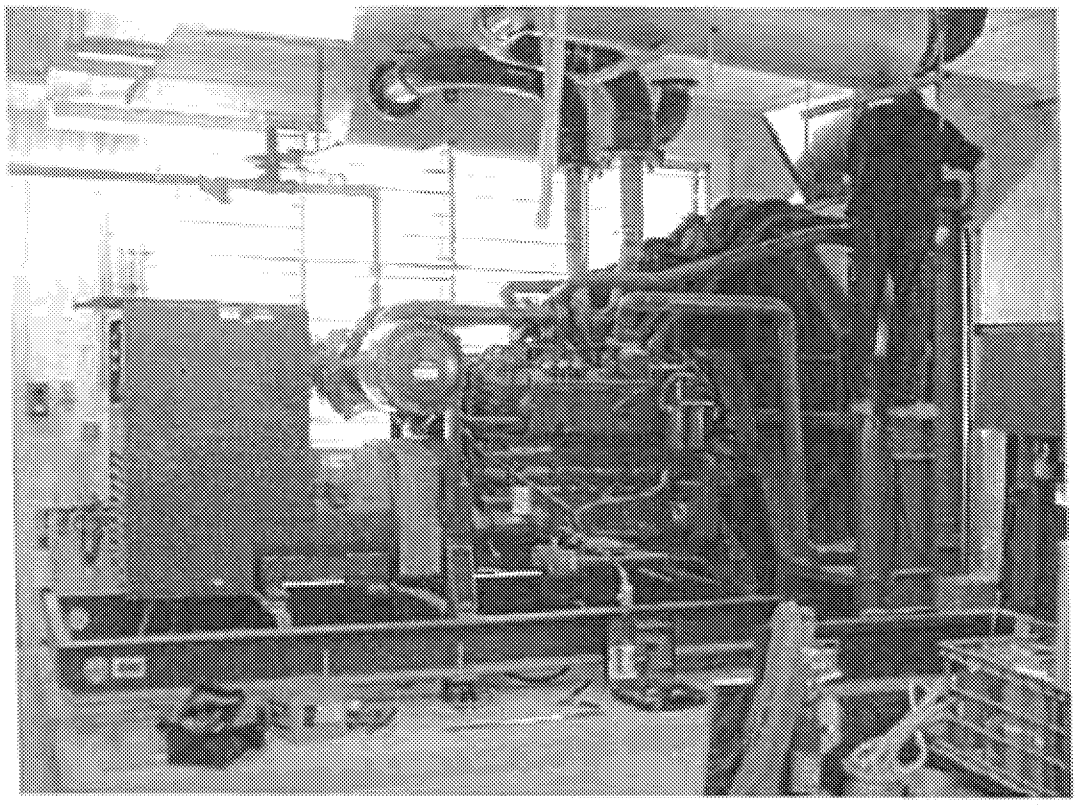
ENGINE GENERATOR

DIVISION 1000

Engine Generator

1010 DESCRIPTION

The emergency engine generator is located in the Equipment Building next to the SBR blowers. In the case of a power failure, the engine generator will automatically start and provide electrical power to run the plant.



The engine generator runs at 1800 rpm, will produce 480-volt, 3-phase voltage, and is rated to generate 395 kilowatts of power. The engine uses natural gas for fuel. There is a battery charger that keeps the starting battery charged.

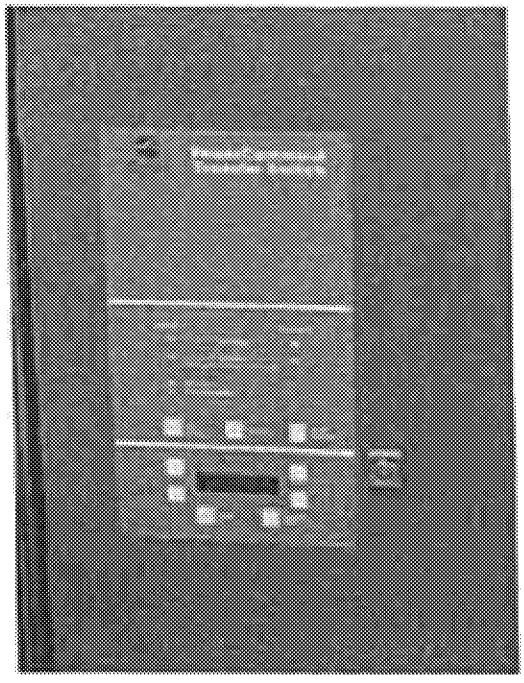
An integral part of the system is the Automatic Transfer Switch that switches the power load from the utility power supply to the engine generator power supply. The transfer switch performs the following functions:

1. Sense the interruption of the utility power supply.
2. Sends a start signal to engine generator.
3. Transfers the power load to the engine generator.

4. Sense the return of the utility power supply.
5. Re-transfers the load to the utility power supply.
6. Sends a stop signal to engine generator.

1020 CONTROLS

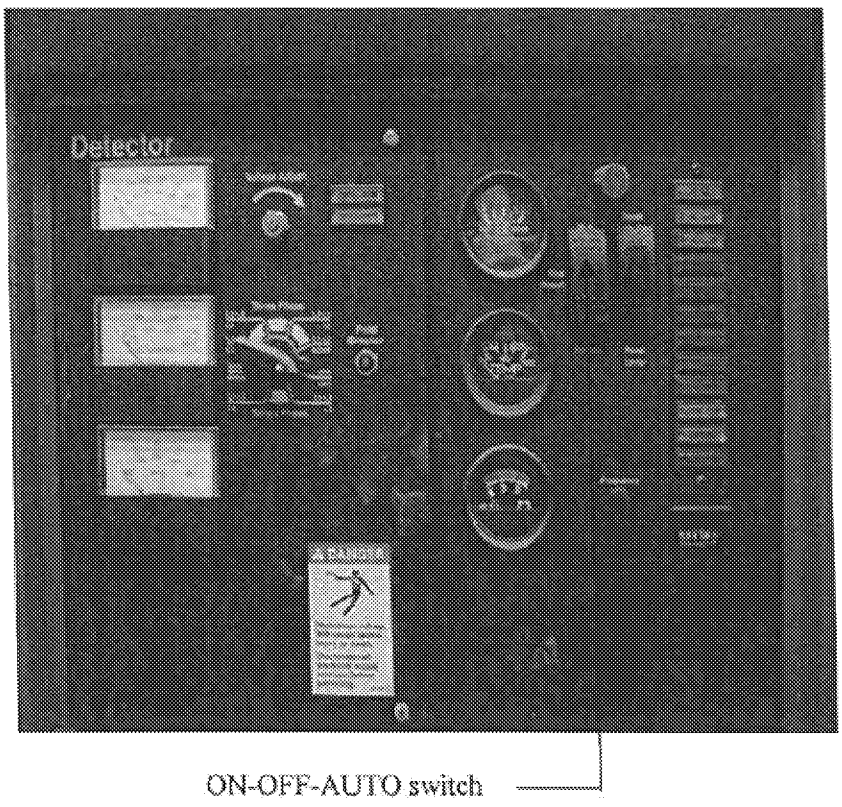
The Odanah Community is served by Bayfield Electric. If this power fails the automatic transfer switch will start the engine generator and will transfer line connections to the engine generator power.



The Automatic Transfer Switch includes a Motor Disconnect toggle switch that is inside the panel enclosure. This switch is only accessible from inside the enclosure. The "Not in Auto" LED on the front of the panel indicates the state of the switch. The switch should be in AUTO. The LED is lit when switch is in the OFF position.

The main breaker for Bayfield Electric is next to the automatic transfer switch.

The control panel on the engine generator is on the engine generator facing the automatic transfer switch.



The mode selector switch has ON-OFF-AUO positions. In AUTO, the engine generator will start if there is power failure. Switch to OFF initiates shutdown of the engine and the engine generator is prevented from running. The engine will start if the operator manually turns the switch ON.

1030 OPERATION

The engine generator control switch should remain in AUTO so that it will start if there is a power failure. The engine generator is frequently tested and exercised. This is done automatically by a programmable controller in the automatic transfer switch. The following schedule is observed:

1. Every other Monday at 7:30 am, the engine starts and runs for 20 minutes without any power load on it.
2. Once per month on Monday at 7:30 am, the engine starts. The automatic transfer switch program switches the load from Bayfield Electric to the engine generator. The engine generator continues to run for another 15 minutes without a load on it before it shuts off.

The Automatic Transfer Switch has interior operator handles for manually transferring the load. Manual operation must be performed by qualified personnel under **NO-LOAD CONDITIONS ONLY. See the manufacture's Engine Generator/Transfer Switch O&M Manual.**

***WARNING**: Manual operations of the transfer switch under load presents a shock hazard that can cause severe personal injury or death.*

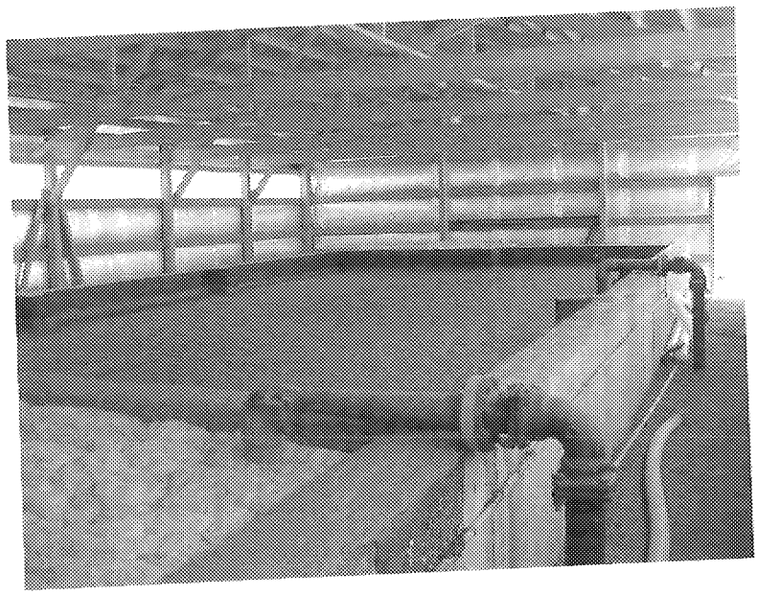
DIVISION 900

AEROBIC DIGESTION

LIST OF FIGURES

DIVISION 900

AEROBIC DIGESTION



A portion of the settled activated sludge in the SBR units must occasionally be removed/wasted to keep the SBR solids inventory at an appropriate level.. The Waste Activated Sludge (WAS) is pumped by the SBR Motive Pumps to the Aerobic Digester.

Biologically active WAS must be stabilized prior to its release to the environment. The aerobic digestion process is characteristic of the activated sludge process because organic matter (WAS) is aerobically digested by a biological population. As the supply of available substrate (food) is depleted, the microorganisms (microbes) begin to consume their own protoplasm to obtain energy for cell-maintenance reactions - this is referred to as the endogenous phase. Aerobic digestion differs from activated sludge because the process of return activated sludge (RAS) and continuous feed (secondary influent) to the microbe population is eliminated. With this in mind, aerobic digestion is then based on the process of endogenous respiration described above.

A proper environment must be maintained for the aerobic digestion process to thrive - oxygen, pH (sufficient Alkalinity), time, and temperature being priority considerations. The overall objective of the aerobic digestion process is the biological oxidation of volatile suspended solids (VSS), which are biodegradable organics, with the intent of producing a stable, condensed, and disposable sludge.

The WAS will undergo aerobic digestion for 20 to 60 days.

After a period of quiescent conditions in the Aerobic Digester, the sludge and water separate forming a bottom, concentrated sludge blanket and an overlying supernatant. The supernatant can be decanted to EQ Basins #1 and #2. Digested sludge is pumped to a lagoon.

910 DESCRIPTION

The aerobic digestion process at the Odanah Community WWTP includes:

- an aerobic digester tank, volume = 88,600 gallons
- coarse bubble diffusion
- one positive displacement blower, M-2-23-1, capacity = 250 scfm
- a floating decanter to remove supernatant
- a sludge withdrawal pump

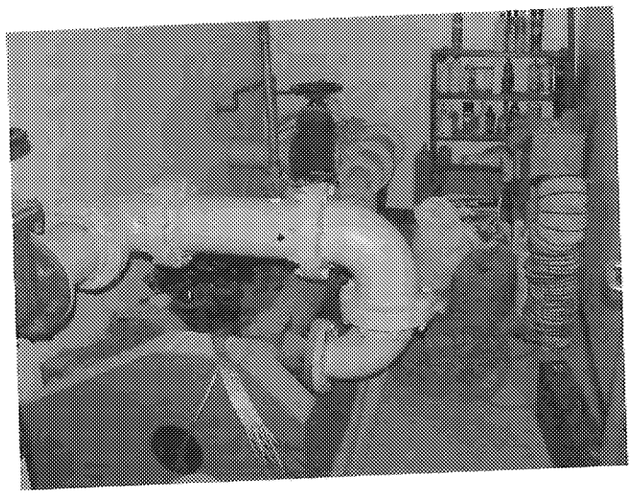


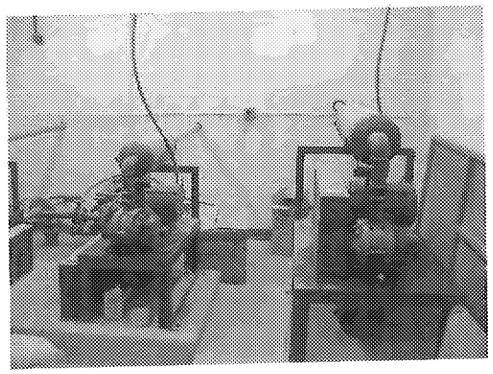
Figure-EQ Basins & Digester shows a plan view of the digester.

The digester tank is equipped with level sensor, LE-2-28-1. This is a submersible pressure transducer for liquid level indication. Its range is 1 – 18 feet. The same type level sensors are used in SBR #1 and #2. High level float switch, LSH-2-29-1, is mounted at _ feet.

The SBR Motive Pumps pump the WAS into the Aerobic Digester periodically (see SBR, Division 500).

One positive displacement rotary blower, M-2-23-1, provides the supply of air at approximately 250 scfm. The air is distributed through coarse bubble air diffusers. The air supplied to the digester is needed by the microbes that feed on the organic matter (WAS), and it helps mix the contents. The positive

displacement blower operates intermittently to maintain sufficient DO in the sludge.



Digester Blower on right

The digester blower is located in the Utility Building. The blower is controlled from the SBR Control Panel, 40-LCP-2-1.

920 CONTROLS

There are controls for:

- Aerobic Digester Blower
- Digested Sludge Pump

Aerobic Digester Blower. The controls are on the SBR Control Panel, 40-LCP-2-1. The control devises on the SBR Control Panel for the blower are shown in the table:

Aerobic Digester Blower Control Devises on SBR Control Panel
HAND-OFF-AUTO switch
TIME-DO switch
BLOWER INTERVAL clock
BLOWER DURATION timer
BLOWER ON DO setpoint
BLOWER OFF DO setpoint

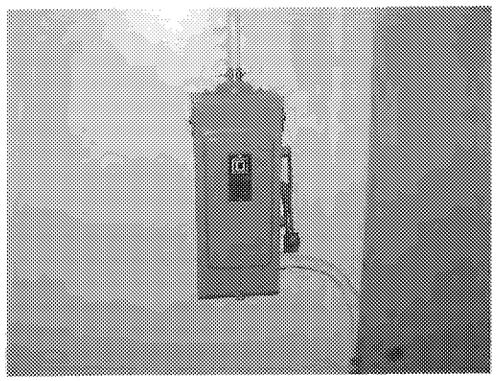
In HAND, the blower will run continuously. In OFF, the blower is prevented from running. In AUTO, the blower is controlled by either the

If the switch is set to TIME, the blower will start at each INTERVAL set on a 24-hour clock. The blower will run for the DURATION in minutes set on a 60-minute timer.

If the switch is set to DO, the blower will start and stop according to dissolved oxygen levels measured in the digesting sludge by DO meter, AE/AIT-2-30-1.

Digested Sludge Pump. The controls include manually operated valves on the suction side and discharges side of the pump. THESE VALVES MUST BE OPEN BEFORE THE PUMP IS RUN. Close the valves after digested sludge has been transferred to the lagoon.

The pump is turned on by manually switching the circuit disconnect switch from OFF to ON.



Decanting. Decanting the Aerobic Digester is done manually.

930 OPERATION

Before placing the aerobic digesters and associated equipment into operation, be sure to follow these steps:

1. Check blower condition, rotation, and operability.

2. Check position of all related manual valves. Make sure decant valve is closed.

3. Conduct wet test on diffuser system.

- Start blower and observe air flow through diffuser system. Replace any malfunctioning diffusers **before** filling digester with WAS.

4. Start up the digester blower.

   - Place the HAND/OFF/AUTO switch into AUTO. Set the other switch to either TIME or DO. The blower will run for the pre-set time on the DURATION timer, starting on each hour as pre-set on the INTERVAL timer. Or, the blower will start and stop according to DO level in the sludge.

When the above steps have been taken, WAS pumping can begin.

The blower will normally run (for example) 30 minutes every hour if TIME is selected. Or, if DO is selected, the blower will start when the DO has dropped to 1 mg/L, and stop when the DO has risen to 3 mg/L.

The digested sludge will regularly be pumped to tanker trucks for disposal. Supernatant decanting will be done with the manual decant valve. During decanting, the operator must visually inspect the condition of the supernatant for carry over solids. Stop decanting when supernatant solids become excessive.

Operators should check the operation of the aerobic digester at least twice per shift. Observe the aeration pattern at the tank surface for possible plugging. Areas of reduced mixing may indicate plugging or insufficient air supply. If the diffusers are plugged, they must be cleaned.

As the supply of available food (WAS) is depleted, the microbes begin to consume their own protoplasm to obtain energy for cell maintenance reactions. When this occurs, the microbes are said to be in an **endogenous state**. The microbes cell tissue is aerobically oxidized to carbon dioxide, water and ammonia. The ammonia from this oxidation is subsequently oxidized to nitrate (NO3) which, when combined with water can lower the digesters pH. The pH should be close to neutral (7), $\pm$ 0.5 pH units, for the microbes to thrive in the digestion process. The pH should be checked once per shift. Accompanying the pH test should be an Alkalinity test of the raw wastewater.

DIVISION 1000

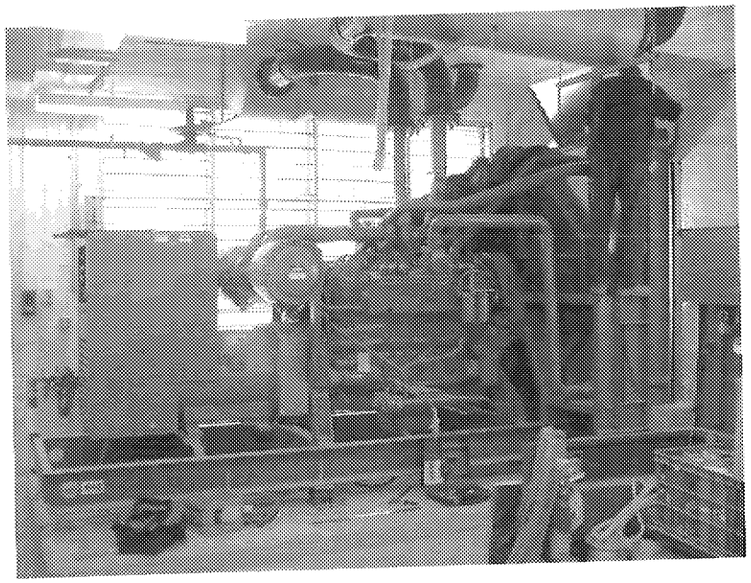
ENGINE GENERATOR

DIVISION 1000

ENGINE GENERATOR

1010 DESCRIPTION

The emergency engine generator is located in the Equipment Building next to the SBR blowers. In case of power failure, the engine generator will automatically start and provide electrical power to run the plant.



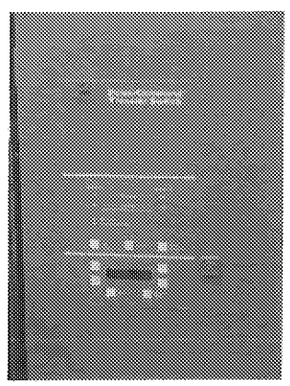
The engine generator runs at 1800 rpm; will produce 480 volts, 3 phase power; and is rated to generate 395 kilowatts. The engine uses natural gas fuel. There is a battery charger that keeps the starting battery charged.

An integral part of the system is the Automatic Transfer Switch that switches the power load from the utility power supply to the engine generator power supply. The transfer switch performs the following functions:

1. Sense the interruption of the utility power supply.
2. Send a start signal to the engine generator.
3. Transfer the power load to the engine generator.
4. Sense the return of the utility power supply.
5. Re-transfer the load to the utility power supply.
6. Send a stop signal to the engine generator.

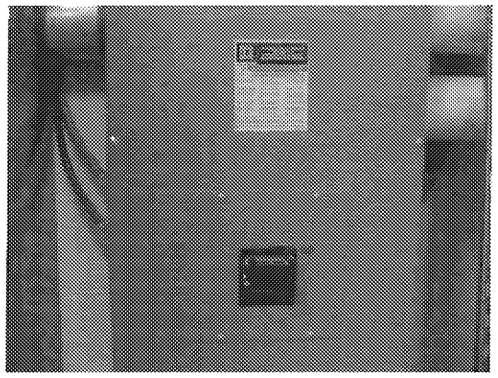
1020 CONTROLS

The Odanah Community is served by Bayfield Electric. If this power fails, the automatic transfer switch will start the engine generator and will transfer line connections to the engine generator power.

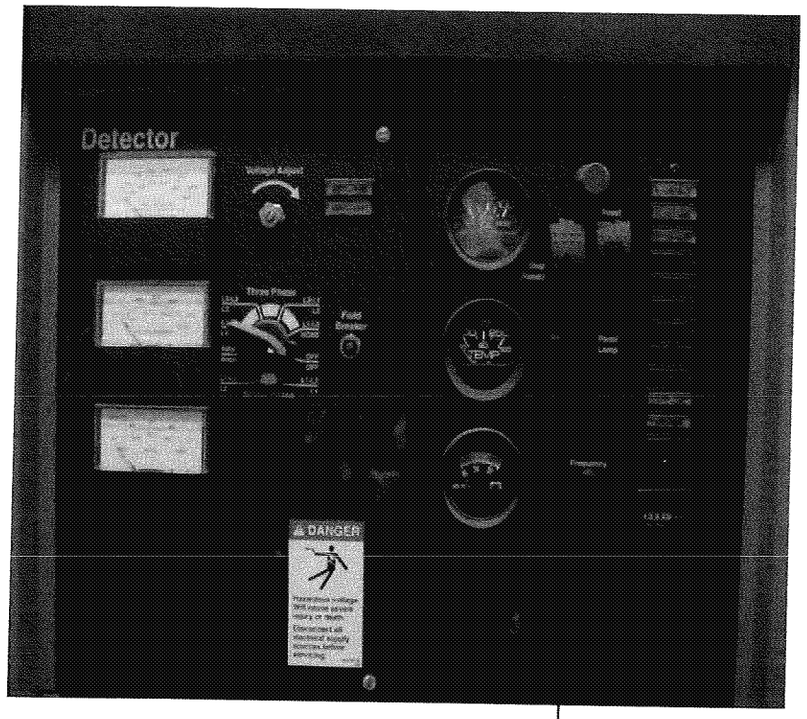


The Automatic Transfer Switch includes a Motor Disconnect toggle Switch that is inside the panel enclosure. This switch is only accessable from inside the enclosure. The "Not in Auto LED" on the front of the panel indicates the state of the switch. The switch should be in AUTO. The LED is lit when the switch is in the OFF position.

The main breaker for Bayfield Electric is next to the automatic transfer switch.



The control panel on the engine generator is on the engine generator facing the automatic transfer switch.



ON-OFF-AUTO switch

The mode selector switch has ON-OFF-AUTO positions. In AUTO, the engine generator will start if there is a power failure. Switching to OFF intitiates shutdown of the engine, and the engine generator is prevented from running. The engine will start if the operator manually turns the switch to ON.

1030 OPERATION

The engine generator control switch should remain in AUTO so it will start if there is a power failure.

The engine generator is frequently tested and exercised. This is done automatically by a programmable controller in the automatic transfer switch. The following schedule is observed:

1. Every other Monday at 7:30 am, the engine starts and runs for 20 minutes without any power load on it.

2. Once per month on Monday at 7:30 am, the engine starts. The automatic transfer switch program switches the load from Bayfield Electric to the engine generator. The engine generator runs under power load for 15 minutes. The program then switches the power back to Bayfield Electric. The engine generator continues to run for another 15 minutes without load before turning off.

The Automatic Transfer Switch has interior operator handles for manually transferring the load. Manual operation must be performed by qualified persons under **NO-LOAD CONDITIONS ONLY. See the manufacturer's Engine Generator/Transfer Switch O&M Manual.**

WARNING: **Manual operation of the transfer switch under load presents a shock hazard that can cause severe personal injury or death.**

APPENDIX A

DESIGN BASIS MEMORANDUM

PRELIMINARY DESIGN BASIS MEMORANDUM
BAD RIVER WWTF
for the
BAD RIVER TRIBE

April 30, 2001-revised

Wastewater Characteristics

Influent Flows and Loadings	Current Flows and Loadings	Design Flows and Loadings
Year	2000	2020
Annual Average Flow, mgd	0.0579	0.14
Maximum Monthly Flow, mgd	0.0688	0.158
Peak Daily Flow, mgd	0.31	0.46
Peak Hourly Flow, mgd	0.347	0.673
Average Annual BOD_5, lb/d	156	379
Maximum Monthly BOD_5, lb/d	188	459
Peak Day BOD, lb/d	389	948
Annual Average TSS	128	312
Maximum Monthly TSS, lb/d	170	418
Peak Day TSS, lb/d	319	790
Average Daily TKN	10	23
Maximum Monthly TKN, lb/d	12	28
Peak Day TKN, lb/d	24	58
Average Daily Total Phosphorus	2.8	6.7
Maximum Monthly Total Phosphorus, lb/d	3.5	8.4
Peak Day Total Phosphorus, lb/d	7.0	17
Maximum Specific Nitrification Rate (@ 20°C), 1/d	0.60	0.60

Effluent Performance Requirements

Parameter	Maximum Level	Period	Sample Frequency	Sample Type
BOD_5, mg/l	10	Monthly Avg.	3 per week	Composite
TSS, mg/l	10	Monthly Avg.	3 per week	Composite
Ammonia	2.0	Weekly Avg.	3 per week	Composite
Phosphorus	1.0	Monthly Avg.	3 per week	Composite
Fecal Coliform	200#/100 ml	Weekly Geo. Mean	3 per week	Grab
pH	6-9	Weekly Avg.	4 times per day	Grab

Receiving Stream Bad River

	Design
Lift Station No. 1	
Number of Pumps	2 (one standby)
Type	Submersible
Impeller	Non-clog
Peak Capacity each, gpm	470
Firm Capacity, gpm	470
Drive	Constant Speed
Raw Wastewater Screening	
Number	1
Type	Packaged Mechanical Fine Screen
Opening Size, inch	1/4
Channel Width, feet	2
Channel Depth, feet	4
Capacity each, mgd	0.673
Influent Equalization (existing SBR system)	
Number	1
Capacity at HWL, gal	72,000
Aeration System Type	Jet Aeration
Standby Oxygen Transfer Capacity, lb/d	140
Number of Mixing/Transfer Pumps	2
Mixing/Transfer Pump Capacity	575 gpm at 24.6 ft TDH
New Influent Return Pumps (2)	100 gpm, each
Number of EQ Basin Blowers	2
EQ Basin Blower Capacity	80 scfm
Activated Sludge System	
Number	2
Type	Sequencing Batch Reactors
Volume each, gal	130,000
Aeration System Type	Jet Aeration
Low Water Level, ft.	11.6
High Water Level, ft.	16
Size, ea. Tank (L x W)	45 ft x 24 ft
Number of SBR Motive Pumps	2
SBR Motive Pump Capacity	1,100 gpm at 24 ft TDH
Number of SBR Blowers	3
SBR Blower Capacity	271 scfm
Maximum Decant Rate	680 gpm

Average Daily Loading	117	284
Maximum Monthly Loading	150	367
Sludge Production, gpd @ 1% TSS		
Average Daily Loading	1,403	3,408
Maximum Monthly Loading	1,803	4,403

Disinfection	
Number	1 new
Type	Ultraviolet Disinfection
Peak Capacity, gpm	690gpm
Number of Lamps	36
Effluent Pump Station	
Number	2
Type	Submersible
Capacity, ea	800 gpm
Drive	Constant Speed
Chemical Feed for Phosphorus Removal	
Chemical Data	
Type	Alum
Solution Concentration, $Al2(SO_4)3*14H_2O$	48%
Specific Weight of Solution	1.33
Solution Weight, lb/gal	11.10
Aluminum by Weight in Solution, lb Al/gal	0.48
Alum by Weight in Solution, lb Alum/gal	5.33
Chemical Feed Rates	
Design Dose, Al to P (mole/mole)	2.00
Design Dose, Al to P (lb/lb)	1.74
Design Dose, gal solution per lb phosphorus removed	3.59
Chemical Feed for removing 1 mg/1 P	

Alum Feed Rate, gpd	Existing Flows	Design Flows
Average Daily Loading	2	4
Maximum Monthly Loading	2	5

Alum Storage	
Type	Two 55-gallon barrels
Storage Time at average daily flow, days	28
Alum Feed Pumps	
Number	2
Type	Solenoid metering pumps
Capacity	0.1 to 1.0 gph
Aerobic Digesters (existing system)	
Number	1
Volume each, gal	88,600
	1

Detention Time, days	Existing Flows	Design Flows
Average Daily Loading	63	26
Maximum Monthly Loading	49	20

APPENDIX B

JET TECH

VARIOUS PAPERS REGARDING OPERATION OF THE SEQUENCING BATCH REACTORS AND SETPOINTS

PRINCIPLE OF OPERATION

PRINCIPLE OF OPERATION

Equipment description

Aeration Jet Header

Jets are ideally suited for use in SBR application because of their ability to operate efficiently, from both a power and maintenance standpoint, in high F:M environments, and their unique ability to mix independent of aeration. The mixed liquor is pulled from the basin through the IDSC (influent distribution and sludge collection) manifold by the pump and recalculated through the inner jet nozzle, this recalculated liquid is referred to as motive liquid. Compressed air flows through the smaller top pipe then down the air chamber where it is combined with the motive liquid and sheared into medium to fine bubbles. The Liquid air mixture is discharged as a high-energy plume into the basin.

IDSC (influent Distribution / Sludge Collection manifold

The Distribution Manifold gently distributes the influent wastewater, across the basin floor, throughout the length of the basin. The manifold is designed for a maximum exit velocity of 0.5 feet per second so the sludge blanket is not disturbed at peak flow conditions. During "Aerated fill and react" mixed liquor is drawn back into the manifold and recalculated as motive liquid for the jet headers. By insuring that the motive liquid is collected uniformly across the basin, the ID/SC helps maintain the complete mix characteristics of the process. One of the most important functions of the ID/SC manifold is that it makes a "Filled Decant" period practical in emergency single tank operation or at peak flow rates.

DECANTER (solids excluding)

A foam filled fiberglass float is permanently attached to the top of the drawtube to support the decanter and suspend the drawtube below the liquid surface. Jet Tech's floating decanter uses spring-loaded solids excluding valves, which are actuated by static head differential upon the opening of a valve, located outside the basin. There are no electo-mechanical parts in the basin. The floating decanter allows reduced settle periods since the decant period can begin when the sludge blanket is approximately four feet below the surface level. Settle period for the floating decanter is about 30 to 45 minutes. Jet tech' decanter requires a minimum head of 3 feet between the bottom level and the discharge point of the decanted effluent. The drawtube on the decanter is at least 18 inches beneath the surface to avoid decanting floating objects, scum or foam, in the effluent. The automatic actuating valve in the jet tech system is located outside the basin in a warm dry place, easily accessible for maintenance and adjustment.

SBR PRINCIPLE OF OPERATION

In an SBR's cycle of operation the oxygen uptake rate, F:M ratio, and D.O. are constantly changing. When aeration is initiated after Anoxic fill period, the F:M ratio is high, and the oxygen uptake rate is very high. At the end of the Aeration period React the F:M ratio is near zero and the D.O. uptake rate will be less than 15 mg/l/hr. It is this non-steady state operation that is one key to the SBR process. The wide swings in the F:M ratio place selective pressures on the biomass.

The period when the F:M ratio and D.O. uptake rate are high is a feast period, food is plentiful, and the D.O. level stays near zero because the oxygen demand exceeds the aeration system's average capacity. This Feast period inhibits slow growing aerobe such as filaments, and encourages the growth of floc-forming facultative organisms.

The period when the F: M ratio and D.O. uptake rate are low is a famine period. This famine period is also known as endogenous respiration. This occurs at he end of react when all available food has been utilized. The famine period inhibits less hardy aerobic filaments, encourages the survival of good settling and facultative organisms. The anoxic versus, aerobic selective pressures on the organisms yield a facultative biomass that forms a tighter floc and settles better than a strictly aerobic biomass.

The SBR (Sequencing Batch Reactor) tanks are designed to operate together, filling in alternating sequence. They are capable of operating independently. When operating sequentially, raw influent is fed first to one tank, and then to the other. Influent is not normally fed to both tanks at the same time. It is this sequencing of feed from one tank to another which, gives the process its name. Each batch is treated, clarified, and discharged while the other tank fills. Each tank will undergo 4 complete cycles per day at design flow. The cycle frequency must increase as the flow rate increases in order to get the liquid through the system.

Consider just one tank. When flows are equal to or less than design, the SBR works as follows. At the beginning of the process cycle, the reactor has finished its treatment and discharge of the previous batch of influent. Therefore, the liquid level is at bottom water level (BWL) or Low Low. The SBR then waits for another batch of influent. This waiting period is call the idle period. After the idle period the tank will begin the fill period.

FILL STEP

The fill period will last 60 minutes, otherwise the fill period will end when top water level is reached (TWL) or high level. Fill is divided into 2 sections, Anoxic fill and Aerated Fill.

Anoxic fill works as an anoxic selector which inhibits most filamentous growth, selects for a good settling, facultative biomass, allows good biological nutrient removal of both nitrogen and phosphorus, and allows the food to accumulate for feast and famine cycle. As the tank fills, initially no aeration is provided. This causes the BOD to accumulate, and depletes the available free oxygen. This is done for many reasons. To develop an optimal biomass, encourage nutrient removal and save energy.

So it is important for the SBR to receive fresh influent with a low D.O. content.

Anoxic fill can either be static or mixed. Mixed fill will equalize the loading throughout the biomass and insures all D.O. is removed. Static fill will allow an accumulation of BOD in the biomass, and will exert a demand for D.O. when mixing occurs. It also is especially valuable during emergency situations, as it will allow filling to occur during settle and decant if necessary. If a portion of the cycle is static, then you should allow for enough mixed fill to mix the contents of the basin and deplete the D.O. before aeration is added. A low strength BOD loading will require a longer static fill % than a high strength loading, so that a true anoxic state can be obtained in the biomass.

An influent sample should be taken, with the D.O., pH, and temp all recorded daily. A COD and or BOD, TSS, Nitrogen and phosphorus tests to be preformed at least weekly.

AERATED FILL

Aerated fill provides additional aeration time is there is insufficient time in react. The air off time provides a denitrification step and provides the feast portion of the feast and famine cycle at the beginning of aeration. You will want to minimize the time in aerated fill to prevent the growth of filaments. During high flow conditions aerated fill will allow you to provide the required aeration time, while shorting the cycle time.

REACT

React provides aeration in the absence of fill, allows complete nitrification, and allows endogenous respiration to be reached by the end of the aeration. The air off time provides a denitrification step. React provides the famine portion of the feast and famine cycle.

By maintaining a long react period all the available BOD can be depleted. The microorganisms are subjected to a relative famine period compared to the beginning of aeration. At the beginning of aerated fill or react, following the anoxic fill, the microorganisms have an excess of BOD, causing a relative feast period. It is partly this stress of feast and famine, which encourages the growth of desirable organisms and provides for nitrogen and phosphorous removal.

The react period must be long enough for the entire BOD to be utilized. As the period begins the D.O. level will remain low, but as the aeration continues by the end of react the D.O. should be around 4 to 5 PPM to insure sufficient oxygen carry over to the next fill cycle. A very high D.O. at the end of react will encourage the growth of undesirable organism as well as wasting energy. A very low D.O. at the end of react would indicate the aeration process was not finished and a longer aeration time is needed or shorter blower off periods. The react period is initially 3 hour and 30 minutes 55 % of the cycle will be aerated. During the last aeration period in the react cycle a MLSS sample should be taken and a 30 minute settable test performed, the temperature, pH, D.O., from the sample recorded, a centrifuge test here will give an indication of the concentration of MLSS. An MLSS test should be performed at least weekly so the total MLSS can be determined and other computations can be determined, such as F: M ratio, sludge age, and sludge volume index. An MLSS concentration of 1500 to 8000 mg/l can be used with a typical concentration being 2000 to 2500 mg/l. You will have to determine what

concentration gives you the best effluent results. Also an oxygen uptake rate test should be performed at the beginning of the react period and the then at the end of the react period. This should be done periodically. A D.O. profile should be performed periodically; this is done by reading the D.O. meter in the basin every 5 minutes throughout the react cycle, and plotting the results on a graph. This will help monitor the D.O. and adjust the blower off times to avoid high D.O. within the cycle.

SETTLE

The first part of settle is settle prep, this step evacuates the air from the Jet Header, releases air bubbles trapped in the biomass and allows good floc formation. This step is 5 minutes and takes time from the total settle period.

Settle has perfectly still conditions for settling of the biomass. This period is usually 45 minutes but can be longer is necessary, provided enough cycle time is available. The 30 minutes settling test conducted during react will give an indication of the settling characteristics the biomass but is a relatively poor indicator of actual conditions in the SBR. Therefore a sludge coring device (Sludge Judge) is use to obtain actual conditions. This is performed at 10 minutes intervals during the settle cycle and plotted on a graph, usually on a weekly basis.

DECANT

Decant cycle removes the treated water (effluent) from the SBR, getting it ready for the next fill cycle. With the decanter being submerged it will prevent floating material from being mixed into the effluent. The solids excluding valves in the decanter prevent solids from entering the decanter during the aeration period. The decanter delivers a range of discharge flows varying directly with the head available to exert the driving force. The average of this range is the specified flow rate. In order to achieve design conditions, the decanter discharge may sometimes need to be throttled to reduce the head available for flow through the decanter. Throttling can be achieved either by limiting the open travel for the automatic valve or by throttling with a separate valve. Field throttling adjustments should be completed with the decanter at the midpoint between top water level and bottom water level.

Tests on the effluent includes temperature, D.O., pH, TSS, BOD and or COD, nitrogen and phosphorus. Results of these tests when compared to the influent tests will provide the operating efficiency of the SBR process.

SLUDGE WASTEING / IDLE

Sludge wasting is performed here. The biomass is as compact as it will be; thus removing sludge here will require less volume to be removed. Removing excess sludge maintains a proper sludge age, prevents excessive sludge blanket, and helps maintain a healthy biomass. Sludge should be removed on a per cycle basis or at lest daily. It is better to remove several small portions than a few large ones.

To estimate the daily quantity of sludge to waste determine the current TSS concentration at the bottom of the sludge blanket, or refer to the last measured waste sludge concentration. WAS is typically 8,500 to 10,000 mg/l. Assume a sludge generation rate of 0.8 lbs. per lbs. of BOD removed per day.
There are many ways to determine wasting rates, total tonns of MLSS per basin, concentration of MLSS, F: M ratio, sludge age, MCRT, SRT (sludge retention time) just to name a few, you must decide which method is right for you and stick to it.
Adjust the wasting rate as necessary to gradually reach the desired MLSS or MLVSS concentration or level desired. Daily wasting is best, if less frequent wasting is necessary, do not operate such that more than 20% of the sludge is wasted at a time. The SBR is designed so that only a small portion of the sludge is wasted with the rest remaining to process the next batch.

MAINTENANCE

Daily check control panels lights and use the vacflush system to flush out jet aeration headers.
Weekly visually check the floats for tangles and fouling, clean as necessary
After the first year then every 2 or 3 years thereafter, dewater the basins and visually inspect the equipment, torque all bolts and anchor bolts. Check all nozzles for clogging and clean as necessary. Check and clean solids excluding valve on decanter as necessary. Inspect all supports, boltholes, and welds for wear cracks, looseness or misalignment.

WARRANTY

Limited product warranty of 1year from startup or 18 months from shipment which ever occurs first.

FLOW PROPORTIONAL STRATEGY

FLOW PROPORTIONAL STRATEGY

PLANT SELECTOR

This setpoint allows the operator to select the state of each SBR. The operator can select manual/off or select any number of tanks to be in auto, depending on the number of tanks available in each system.

BLOWER OPERTION

Depending on the blower configuration of each system, the operator can select the number of blowers to run for each SBR during aeration. Typical selections are lead, lag and/or standby. Systems with two blowers will alternate blowers with each tank using the lag blower as the standby blower. Systems with more than two blowers can either alternate blowers with or without a dedicated standby blower, or dedicate a blower for each SBR and use a standby blower that is common to all SBR tanks.

SEQUENCE OPERATION

During initial startup of multiple tanks, or sequencing, one tank should be at Bottom Water Level (BWL) at the time the selector switch is put into the AUTO position for proper operation. If both tanks are within .5' of BWL then tank No.1 begins in Anoxic Fill and tank No.2 begins in Idle. If either tank is above .5' from BWL then that tank will begin in Settle while the other tank will begin in Anoxic Fill. If both tanks are above .5' from BWL than the tank with the lowest level will enter Filled Settle and the other tank enters Settle. However, if more than one tank is in Settle, the control system will only allow one tank to Decant at a time.

SEQUENCE TO SINGLE TANK OPERATION

When either selector is moved from AUTO to MANUAL the tank still in service will enter a fill step and the other tank will be in idle.

STEPS OF TREATMENT

The SBR treatment steps are listed below. Not all of these steps occur during every batch. Step occurrence is dependent upon flow conditions and selected plant mode of operation.

Idle (sequencing only)
Anoxic Fill
Aerated Fill
React (sequencing only)
Settle
Filled Settle
Decant (sequencing only)
Filled Decant
Waste Sludge

FAILURE RESPONSE

The operator can choose between disabled or enabled for each SBR. If the operator selects disabled, when an alarm occurs, the control system will generate an alarm and continue to cycle the SBR. If enabled is selected and an alarm occurs, the control system will decide if the alarm is critical or non-critical and take the appropriate response.

If a critical alarm is detected the control system will sound an alarm and indicate which piece(s) of equipment has failed, and give the operator five minutes to correct the problem. If the operator has not cleared the alarm within five minutes the tank will be taken out of service until the operator clears the alarm and places the tank back into service.

If a non-critical alarm is detected the control system will sound an alarm and indicate which piece(s) of equipment has failed. The tank will continue to cycle and the alarm will be cleared once the alarm has been acknowledged and the failure no longer exists.

SETPOINTS

The following data shows the available setpoints, the wording on the operator interface, the setpoint units, and the initial value.

Setpoint	Menu#	min	max	value	initial
SBR SETPOINTS	1.				
SBR 1 Select	2.	Manual	auto	select	?
SBR 2 Select	3.	Manual	auto	select	?
FAILURE RESPONSE	4.				
tank 1	5.	disable	enable	select	?
tank 2	6.	disable	enable	select	?
IDLE	7.				
idle	8.	0	1440	minutes	?
aerated idle	9.	0	1440	minute	?
ANOXIC FILL	10.				
%Static	11.				
single tank	12.	0	100	%	?
multiple tanks	13.	0	100	%	?
Multipliers	14.				
single tank	15.	0	10.0	multiplier	?
sequencing	16.	0	10.0	multiplier	?
Anoxic Fill Adj.	17.	-200	1440	value	365
AERATION	18.				
Single Tank	19.				
min. air time	20.	0	1440	minutes	?
max. air time	21.	0	1440	minutes	?
Multiple Tanks	22.				
min. air time	23.	0	1440	minutes	?
max. air time	24.	0	1440	minutes	?
Air Slope	25.				
1 tanks	26.	0	720	minutes	?
2 tanks	27.	0	720	minutes	?

Min. React	28.	2	360	minutes	?
AERATION ADJ.	29.				
tank 1	30.	-200	360	minutes	?
tank 2	31.	-200	360	minutes	?
AERATION ON/OFF	32.				
tank 1 air off	33.	0	300	minutes	?
tank 1 air on	34.	0	300	minutes	?
tank 2 air off	35.	0	300	minutes	?
tank 2 air on	36.	0	300	minutes	?
SLUDGE WASTING	37.				
tank 1 select	38.	once/day	once/cycle		?
tank 1 time	39.	0	120	minutes	?
tank 2 select	40.	once/day	once/cycle		?
tank 2 time	41.	0	120	minutes	?
LEVEL SETPOINTS	42.				
Tank 1	43.				
BWL	44.	1.0	36.0	feet	?
TWL	45.	1.0	36.0	feet	?
Tank 2	46.				
BWL	47.	1.0	36.0	feet	?
TWL	48.	1.0	36.0	feet	?
Vacflush	49.	0	20	minutes	?
Settle Prep	50.	2	20	minutes	?
Settle	51.	15	120	minutes	?
Maximum Decant Time	52.	5	360	minutes	?
CONFIG SETPOINTS	53.				
MAX ANOXIC FILL	54.				
1 tanks	55.	0	720	minutes	?
2 tanks	56.	0	720	minutes	?
MAX FILL TIME	57.				
1 tanks	58.	0	720	minutes	?
2 tanks	59.	0	720	minutes	?
TANK SPEC's	60.	(tank specific setpoints are not available)			
PLANT SETPOINTS	61.				
plant design	62.	0	35000	gpm	?
flow avg. time	63.	5	49	minutes	?
settle safety	64.	0	120	minutes	?
SET TIME OF DAY	65.	YY/MM/DD – HH/MM			?
SETPOINT RINTOUT	66.	request		select	

It is likely that if the setpoints are adjusted improperly the SBR system will not give satisfactory effluent quality, and/or result in overflowing the tank(s). A series of calculations are provided by U.S. Filter/Jet Tech to assist in determining the allowable range of setpoints for this plant.

SETPOINT DESCRIPTION

Fill Time (max. fill) – The operator selects the maximum number of minutes the control system will allow for Anoxic Static Fill, Anoxic Mixed Fill and Aerated Fill. If the water level has not reached TWL and the Maximum Fill time has expired, fill will be terminated and the tank will advance to the next treatment step. In single tank mode, all treatment steps are fill steps and an influent valve is always open, maximum fill time is not necessary.

Anoxic Fill – The operator has the flexibility of adjusting Maximum Anoxic Fill based on the number of tanks in auto. Cycles with calculated Anoxic Fill greater than the Maximum Anoxic Fill setpoint will use the Maximum Anoxic Fill setpoint as the actual Anoxic Fill for that cycle. Cycles with calculated Anoxic Fill less than the Maximum Anoxic Fill setpoint will use the calculated Anoxic Fill time for that cycle. Also, the operator has the ability to separate the Anoxic Fill into Anoxic Static Fill and Anoxic Mixed Fill.

% Anoxic Static Fill
Continuous Feed % - In a single tank mode (only one tank in auto) this setpoint determines the percent of the calculated Anoxic Fill time each cycle to be used in Anoxic Static Fill, the remaining Anoxic Fill time will be Anoxic Mixed Fill.

Tank % - This setpoint allows the operator to select the percent Anoxic Fill to be Static for an individual tank when multiple tanks are in auto. Each tank will have an individual setpoint, allowing the operator the flexibility to select different Anoxic Static Fill times for each tank.
Anoxic Mixed Fill – The remainder of Anoxic Fill after Static Fill is complete will be Anoxic Mixed Fill. This gives the operator the ability to mix the tank during fill, without aeration.

Single Tank – With one tank in auto the control system will take the single tank calculated Anoxic Fill time and multiply it by the multiplier setpoint and this will be the Anoxic Fill time use for the current cycle.
If more than one tank is in auto the control system will use the multiplier setpoint for the number of tanks in auto and generate an Anoxic Fill time for each cycle. This calculated Anoxic Fill time will be compared to the Maximum Anoxic Fill setpoint as described above.

Aeration - Once the Anoxic time is complete the tank will enter Aeration, which is split into two different steps, Aerated Fill and React. The system calculates the required aeration time based on the current percent of design flow and the aeration setpoints entered by the operator. Aerated Fill is the time remaining after completion of Anoxic Fill and either the Maximum Fill time expires or the level reaches TWL. Once one of these two conditions has been met the SBR enters React until the required aeration time is complete. An operator can lengthen or shorten Aerated Fill by adjusting the Anoxic Fill setpoint.

Minimum Air (min. air) – The control system will calculate the required Aeration time for each cycle, then compare the calculated Aeration time with the min. air setpoint. If the calculated Aeration time is lower than the min. air setpoint the control system will use the min. air setpoint as the required Aeration time for the current cycle. The control system has separate setpoints for single tank mode and multiple tanks in auto.

Maximum Air (max. air) – The control system will calculate the required Aeration time for each cycle, then compare the calculated Aeration time with the max. air setpoint. If the calculated Aeration time is more than the max. air setpoint, the control system will use the max. air setpoint as the required Aeration time for the current cycle. The control system has separate setpoints for single tank mode and multiple tanks in auto.

Air Adjustment – After the control system has calculated the Aeration time the air adjustment setpoint will be added/subtracted (operators are allowed to enter negative numbers) to the calculated Aeration time, if the adjusted time is within the min. and max. aeration setpoints it will be the Aeration time used for the current cycle. The control system has separate setpoints for single tank mode and multiple tanks in auto.

Air Slope – This setpoint is used to generate an actual slope for calculating the required Aeration time. The setpoint represents the minutes of aeration required at design flow, or 100% of design. As flow increases/decreases the required aeration will follow the air slope. If the air slope setpoint is set to 100 minutes, at 100% of design flow the required Aeration time would be 100 minutes, at 50% of design flow the required Aeration time would be 50 minutes. The control system allows the operator to enter a separate setpoint for single tank mode and multiple tanks in auto.

Minimum React (min. react) – This setpoint ensures a minimum amount of React each cycle, regardless of the required Aeration time, and the amount of Aerated Fill. The control system will make sure the React cycle is not less than the min. react setpoint. Single tank mode does not contain a React cycle, therefore the min. react setpoint does not apply.

Aeration On/Off Time – When an SBR enters an Aeration step the blowers will run for the duration of the Aeration On time setpoint. The blowers will shut off for the duration of the Aeration Off time setpoint and continue to cycle between Aeration On & Off for the duration of the entire Aeration cycle. If a setpoint of "0" is entered for the Aeration Off time the blowers will run continuously throughout the aeration cycle.

Vacflush - At the end of an Aeration cycle the control system will initiate a Vacflush cycle (if the setpoint is above 0). If dry pit pumps are used, the Vacflush pump suction and pump discharge valves are positioned for Vacflush and the pump is turned on and will continue to run for the duration of the Vacflush setpoint. If reversing pumps are used, the pump will be started in the reverse direction and will continue to run for the duration of the Vacflush setpoint. Once the Vacflush cycle is complete, the valves and pump(s) are returned to their normal operation positions. If the Vacflush setpoint is 0 then the control system will not initiate a Vacflush cycle.

Settle Prep – This setpoint allows the operator to adjust the amount of time the motive pump will run after aeration is complete.

Settle – This is a treatment step, which the SBR tank has no equipment running, no valves are open, allowing the solids in the tank to settle prior to entering the Decant. Though Settle Prep has a separate setpoint, the time the operator has entered into the Settle setpoint begins at the beginning of Settle Prep. The Settle Prep setpoint is only used to determine the amount of time the motive pumps run after aeration is complete, which is done to protect the pumps from air lock and enhance settlability in the SBR's.

Decant - Is not a timed treatment step, when an SBR tank enters Decant the control system will monitor the water level in the tank. When the water level reaches the bottom water level (BWL) setpoint Decant is terminated.

Maximum Decant – When the SBR enters Decant the Maximum Decant time begins, this setpoint is designed as an emergency backup. The control system is monitoring the equipment for failure to perform required functions, if no equipment has failed and BWL is not reached within the time the operator has determined reasonable, the control system will alarm this condition and continue with the next treatment.

Waste Sludge - The operator selects the number of minutes he wants to Waste Sludge form each SBR. Individual setpoints are provided for each tank, allowing the operator the flexibility to select different Waste Sludge times for each SBR.

Frequency – This setpoint gives the operator the flexibility of choosing to Waste Sludge one time a day or each cycle. If one time a day has been selected the control system will Waste Sludge the first time and SBR enters Idle, after 7:00 am. If the operator has decided to Waste Sludge each cycle, every time an SBR reaches Idle the control system will Waste Sludge. In high flow conditions there may not be an Idle period, if this occurs Waste Sludge will be bypassed until the next time the tank reaches Idle.

Bottom Water Level (BWL) – The control system uses the BWL setpoint during Decant and at the initial startup of an SBR tank. Once an SBR enters a Decant setup the control system monitors the water level, when the water level reaches the selected BWL setpoint the Decant step is terminated. When a tank is placed into auto the control system will check the current level, if it is within .5 feet of the BWL setpoint, the tank will either enter Anoxic Fill or Idle. If the current level is above BWL setpoint plus .5 feet the tank will enter Anoxic Fill or Settle. If more than one tank is in auto the control system will place the tank with the lowest water level into Anoxic Fill and the other tank(s) will enter Settle or Idle based on the current level as described above. If only one tank is in auto the tank will be placed in Anoxic Fill or Filled Settle based on the water level as described above. Regardless of the number of tanks in auto, the control system will always place one tank in a fill step to ensure the system always has an influent valve open at all times during automatic operation.

Top Water Level (TWL) – This setpoint allows the operator to select a level in each SBR tank which represent a fill batch. While an SBR is in a fill step, the control system monitors maximum times the operator has selected for Anoxic Static Fill, Anoxic Mixed Fill and Aerated Fill. If the current level in SBR reaches TWL before the combined fill times are complete, the control system will terminate fill and advance to the next step.
Bottom Water Level Low Limit (BWL Low Limit) – This setpoint is used as an emergency backup to the BWL setpoint. If the BWL setpoint is set above TWL or below the BWL Low Limit setpoint, the BWL Low Level setpoint will be used instead of the BWL setpoint.

Wall Height – This setpoint is used to establish a software emergency Top Water Level (ETWL). One foot will be subtracted from the wall height setpoint and used during high flow conditions as ETWL. It is recommended to set the wall height two feet above TWL.

All of the level setpoints are tank specific. The operator has the flexibility of adjusting the level in each tank to meet specific conditions that may occur.

Surface Area – The control system uses the surface area setpoint of the tank in a fill cycle when calculating the current percent of design flow. If the surface area setpoint is not the same as the actual surface area of each SBR rank, the calculated flow rate will not be accurate.

Plant Design – This setpoint represents the gallons per minute the plant was designed to handle, or 100% of design flow. The control system uses this setpoint when calculating current percent of design flow.

Flow Samples – The control system uses this setpoint to establish an averaging period when collecting flow samples to calculate the current percent of design flow. Averaging periods are used to smooth out the instantaneous peaks eliminating unnecessary adjustments by the control system.

EFFECTS OF STATIC AND MIXED ANOXIC FILL ON SBR PROCESS

The Effects of Static and Mixed Anoxic Fill on SBR Process Including Biological Phosphorous Removal

Sequencing batch reactors, with an ID/SC, distribute the flow across the floor of the tank. The idea is to distribute the BOD evenly throughout the biomass without needing to run a mixer or the motive pump. While the ID/SC distributes flow throughout the length of the basin, an even distribution throughout the entire biomass without mixing may not be achieved. If the blanket is not getting mixed, the BOD will mostly be concentrated within several feet of the ID/SC. If the BOD concentration is low this won't be a problem; except for very long anoxic fills (over 2 hours).

As waste strength increases, the quicker the biomass in the immediate vicinity of the ID/SC becomes overloaded, goes septic and begins producing hydrogen sulfide. If substantial quantities of hydrogen sulfide are being produced on a regular basis, it will lead to the proliferation of sulfide eating bacteria (Chemolithoautotrophic). Most of these bacteria are filamentous and can therefore lead to bulking. In order to prevent excessive build up of BOD, some mixing may be required. In plants with very high BOD concentrations, most of the fill may need to be mixed.

The big advantage of our SBRs is that we can adjust how much mixing is used. On lightly loaded plants, we can save energy by not mixing. With plants that have high BOD concentrations, the percent of mixed fill is optimized for existing plant conditions. It is not as critical on flow proportional plants that have 4 or more basins to have mixed fill due to the shorter fill times. Batch feed plants also don't need mixed fill unless loading is very high. Typically, at startup, the percent static setpoint will be set at 75%, leaving 25% mixed. If the actual BOD concentration at startup is known to be very high, we may start with more mix.

Biological phosphorous removal adds new considerations to the process. The first step in biological phosphorous removal is to have an anoxic/anaerobic fill. When fill begins, with D.O. and nitrates non-existent in the sludge blanket, anaerobic acid formers will begin to ferment the soluble BOD, and release short chain volatile fatty acids (VFA) as a waste product. If the influent has a low BOD concentration it is important to have most of the fill cycle static. This will concentrate the BOD to the fermenters to allow a more rapid VFA production. If the BOD concentration is high, more mixing is required to spread the loading out to more of the biomass.

It is important to have most or all of fill anoxic. The higher percent of fill that is aerated, the less soluble BOD can be converted to VFA's. If the SBOD:P ratio is close to the minimum, and some of fill is aerated there may not be enough SBOD being converted to VFA's to achieve sufficient phosphorous removal.

The VFA's are used as food by the bio-P organisms. In order to take up the fatty acids

fatty acids to be produced and the phosphorous to be released. So, for good removal it is important to have at least forty-five minutes to an hour of anaerobic fill, which is why no nitrates should be left at the beginning of fill. Nitrates that are present at the beginning of fill must first be removed through denitrification before acid formation can begin.

If anaerobic conditions continue for some time after all of the fatty acids are taken up by the Bio-P bacteria, secondary release of phosphorous will occur. Since this occurs without the uptake of VFA's, there won't be enough food taken up to allow complete uptake of the phosphorous during the subsequent aeration cycle. This will cause an increase in effluent phosphorous concentration. Secondary release begins to occur after 1½ to 2 hours of anoxic fill. For this reason, when biological phosphorous removal to <1mg/l is required, batch feed, or 4 or more tank flow proportional systems should be used.

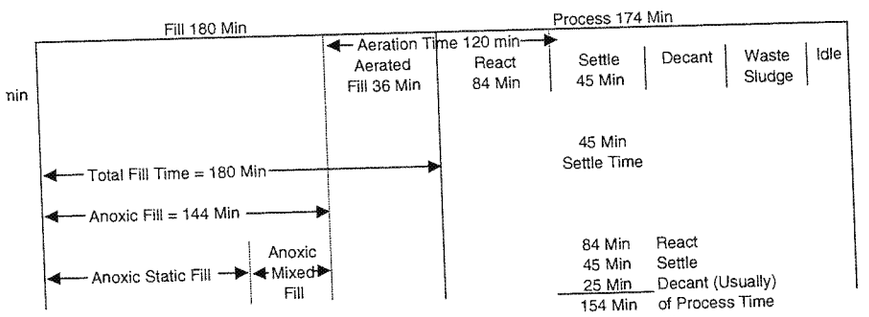
After the phosphorous release is complete, aeration can begin. During aeration, the bio-P organisms metabolize the food stored during fill, and reproduce. Phosphorous uptake begins, thus preparing for the next anaerobic period. The uptake can greatly exceed the release, due to the greater population, thereby having an overall effect of removing phosphorous from the water. Proper age must be maintained by frequent wasting. If the aeration time is too short, the Bio-P organisms won't finish the uptake of phosphorous, causing a high effluent phosphorous concentration.

It is important not to over aerate. If aeration continues once all of the BOD from the batch is used up, the bio-P organisms will be forced to use internal stores of glycogen as a food source. Glycogen is needed for phosphorous release. If it is used up for endogenous respiration, it will not be available for the phosphorous release. Therefore, no short chain fatty acids will be taken up and the bio-P organisms will lose their competitive advantage. If this continues for an extended period, there will not be enough bio-P organisms left to remove the phosphorous.

The bio-P organisms also have the ability to take up phosphorous while denitrifying. By denitrifying while still taking up phosphorous, the overall oxygen demand will be reduced. This can be achieved by cycling the blowers on and off.

TYPICAL SBR CYCLE BREAKDOWN

Bad River Band
5.9 HR. CYCLE
2-Tank System



84 Min React
45 Min Settle
25 Min Decant (Usually)
154 Min of Process Time
19 min Idle
Always Leave 10 Min For Idle

Process Cycle
React
Settle
Decant
Waste Sludge
Idle
→ 174 Min

= Anoxic Static Fill
Anoxic Mixed Fill
Aerated Fill
→ 180 Min

***** Anoxic Static Fill % = 0.5 or 50%
Then of the 144 Min Anoxic Fill
Time 50% of This Time Is Anoxic Static
Fill Or 72 Min Anoxic Static Fill
The Remain 72 Min Must Be
Anoxic Mixed Fill

l Time = 144
Time = 180
ile For Aerated Fill
Total Fill Time = 180
Anoxic (Static and Mixed) Fill Time = 144
36 Min Of
Fill Left If Fill Is Not
Anoxic Then It Must Be
Aerated. *****

Name	Bad River Band	
anks	2	Time, min
Time, hrs	3	180
ill Time, %	80%	144
l, %	50%	72
Fill, hrs	1.00	60
rs	1.00	60
me, hrs	0.75	45
Time, hrs	0.43	25
e, hrs	0.32	19
Time, hrs	2.00	120
ycle Time, hrs	5.90	353
l Fill, hrs	0.60	36
ime, hrs	1.40	84
rocess Time, hr	2.90	174
s Time, hrs	2.58	154
Mix Time, hrs	1.20	72

TABLE

PERCENT OF DESIGN FLOW (97 GPM)
VS.
VARIOUS SBR PARAMETERS

oxic Multiplier and Balanced Aeration Times for Flow Proportional Control Strategy

Max Anoxic Time initial:		150			Min Air initial:	60	Min Air change:	60
					Max Air initial:	180	Max Air change:	180
		Max Anoxic Time change:		150	Air Adjust initial:	0	Air Adjust change:	0
noxic	Anoxic	Current Calc	Anoxic	Projected Calc	Air Slope initial:	180	Air Slope change:	180
inutes	Multiplier #1	Anoxic time	Multiplier #2	Anoxic time		Aeration Time #1		Aeration Time #2
366	1.00	150	1.00	150		60		60
348	1.00	150	1.00	150		60		60
330	1.00	150	1.00	150		60		60
314	1.00	150	1.00	150		60		60
298	1.00	150	1.00	150		60		60
282	1.00	150	1.00	150		60		60
267	1.00	150	1.00	150		60		60
253	1.00	150	1.00	150		63		63
239	1.00	150	1.00	150		72		72
226	1.00	150	1.00	150		81		81
213	1.00	150	1.00	150		90		90
201	1.00	150	1.00	150		99		99
189	1.00	150	1.00	150		108		108
178	1.00	150	1.00	150		117		117
167	1.00	150	1.00	150		126		126
157	1.00	150	1.00	150		135		135
147	1.00	147	1.00	147		144		144
138	1.00	138	1.00	138		153		153
129	1.00	129	1.00	129		162		162
120	1.00	120	1.00	120		171		171
112	1.00	112	1.00	112		180		180
105	1.00	105	1.00	105		180		180
97	1.00	97	1.00	97		180		180
90	1.00	90	1.00	90		180		180
84	1.00	84	1.00	84		180		180
78	1.00	78	1.00	78		180		180
72	1.00	72	1.00	72		180		180
66	1.00	66	1.00	66		180		180
61	1.00	61	1.00	61		180		180
56	1.00	56	1.00	56		180		180
52	1.00	52	1.00	52		180		180
48	1.00	48	1.00	48		180		180
44	1.00	44	1.00	44		180		180
40	1.00	40	1.00	40		180		180
37	1.00	37	1.00	37		180		180
33	1.00	33	1.00	33		180		180
30	1.00	30	1.00	30		180		180
28	1.00	28	1.00	28		180		180
25	1.00	25	1.00	25		180		180
23	1.00	23	1.00	23		180		180
21	1.00	21	1.00	21		180		180

		Possible	Without filled		Number of tanks:	2			
		Watchdog	decants		Cycle times in minutes:	360			
rated Fill	Available	reduction	air time	available	Fill time in minutes:	180			
	react time	react time	balanced	Idle time	Settle time in minutes:	45	Fill	Cycle	Aeration
30	30	30	yes	105	Idle time in minutes:	0	Time	Time	Time
30	30	30	yes	104	Minimum react in minutes:	10	180	360	60
30	30	30	yes	102	Decant time @ design in minutes:	30	180	360	60
30	30	30	yes	101	Settle prep in minutes:	0	180	360	60
30	30	30	yes	99	Waste sludge in minutes:	0	180	360	60
30	30	30	yes	98	Settle safety time	30	180	360	60
30	30	30	yes	96	Setpoints initial		180	360	60
30	33	33	yes	92	Number of tanks:	2	180	360	60
30	42	42	yes	81	Cycle times in minutes:	360	180	360	63
30	51	51	yes	71	Fill time in minutes:	180	180	360	72
30	60	60	yes	60	Settle time in minutes:	45	180	360	81
30	69	69	yes	50	Idle time in minutes:	5	180	360	90
30	78	78	yes	39	Minimum react in minutes:	15	180	360	99
30	87	87	yes	29	Decant time @ design in minutes:	30	180	360	108
30	96	96	yes	18	Settle prep in minutes:	5	180	360	117
30	105	105	yes	8	Waste sludge in minutes:	0	180	360	126
33	111	105	yes	6	Settle safety time	10	180	360	135
42	111	105	yes	5	Blower on:	10	180	360	138
51	111	105	yes	3	Blower off:	60	180	360	147
60	111	105	yes	2			180	360	156
68	112	105	no	0			180	360	165
66	114	96	no	0			180	360	173
67	113	89	no	0			171	343	163
67	113	82	no	0			164	327	155
66	114	75	no	0			157	313	148
66	114	69	no	0			150	300	141
66	114	63	no	0			144	288	135
67	113	58	no	0			138	277	130
68	112	54	no	0			133	267	126
68	112	49	no	0			129	257	121
68	112	45	no	0			124	248	117
68	112	41	no	0			120	240	113
68	112	37	no	0			116	232	109
69	111	34	no	0			113	225	106
69	111	31	no	0			109	218	103
70	110	28	no	0			106	212	100
70	110	25	no	0			103	206	98
69	111	22	no	0			100	200	95
70	110	20	no	0			97	195	92
69	111	17	no	0			95	189	89
69	111	15	no	0			92	185	87
							90	180	84

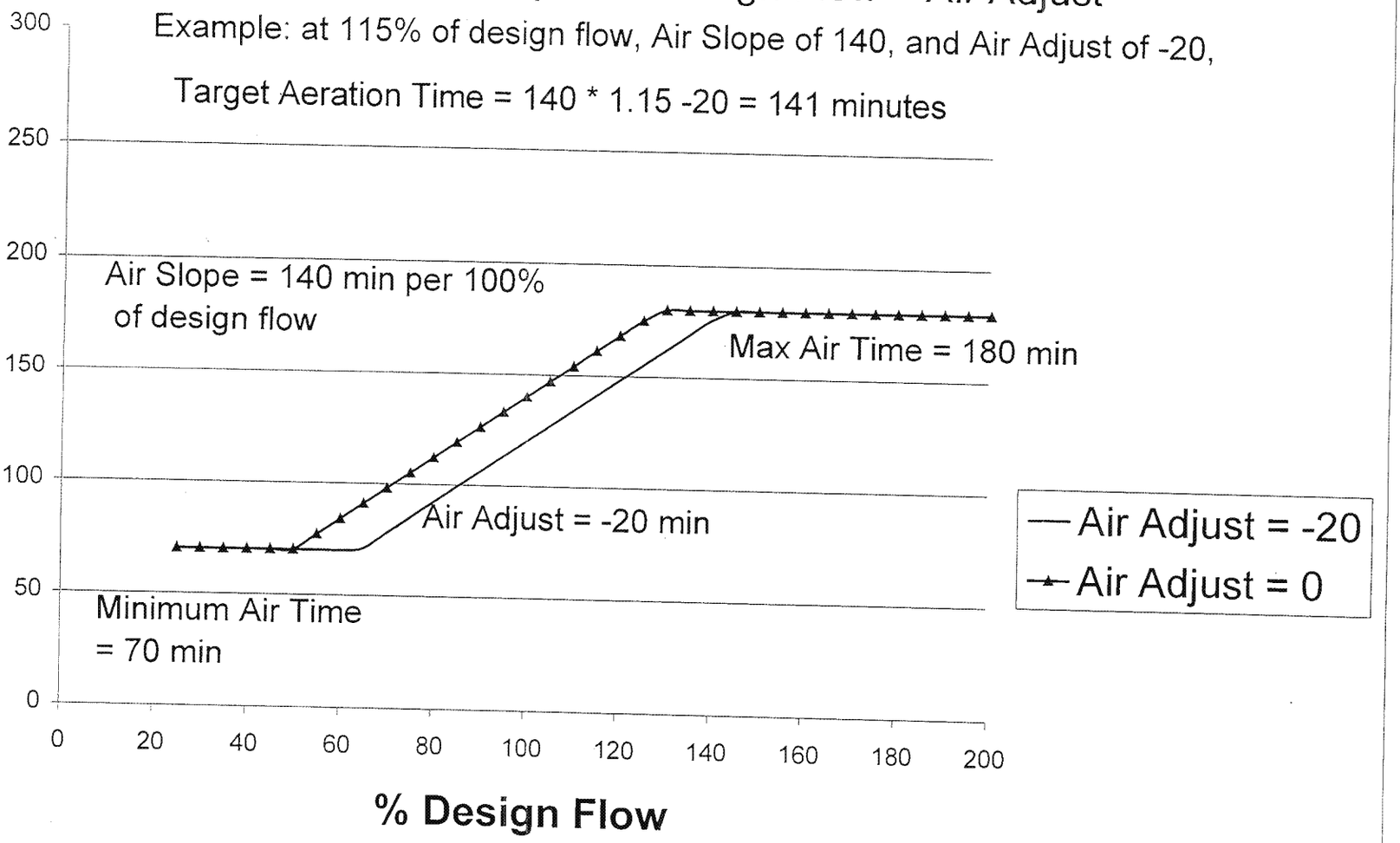
CHARTS

Omniflo Flow-Proportional Aeration

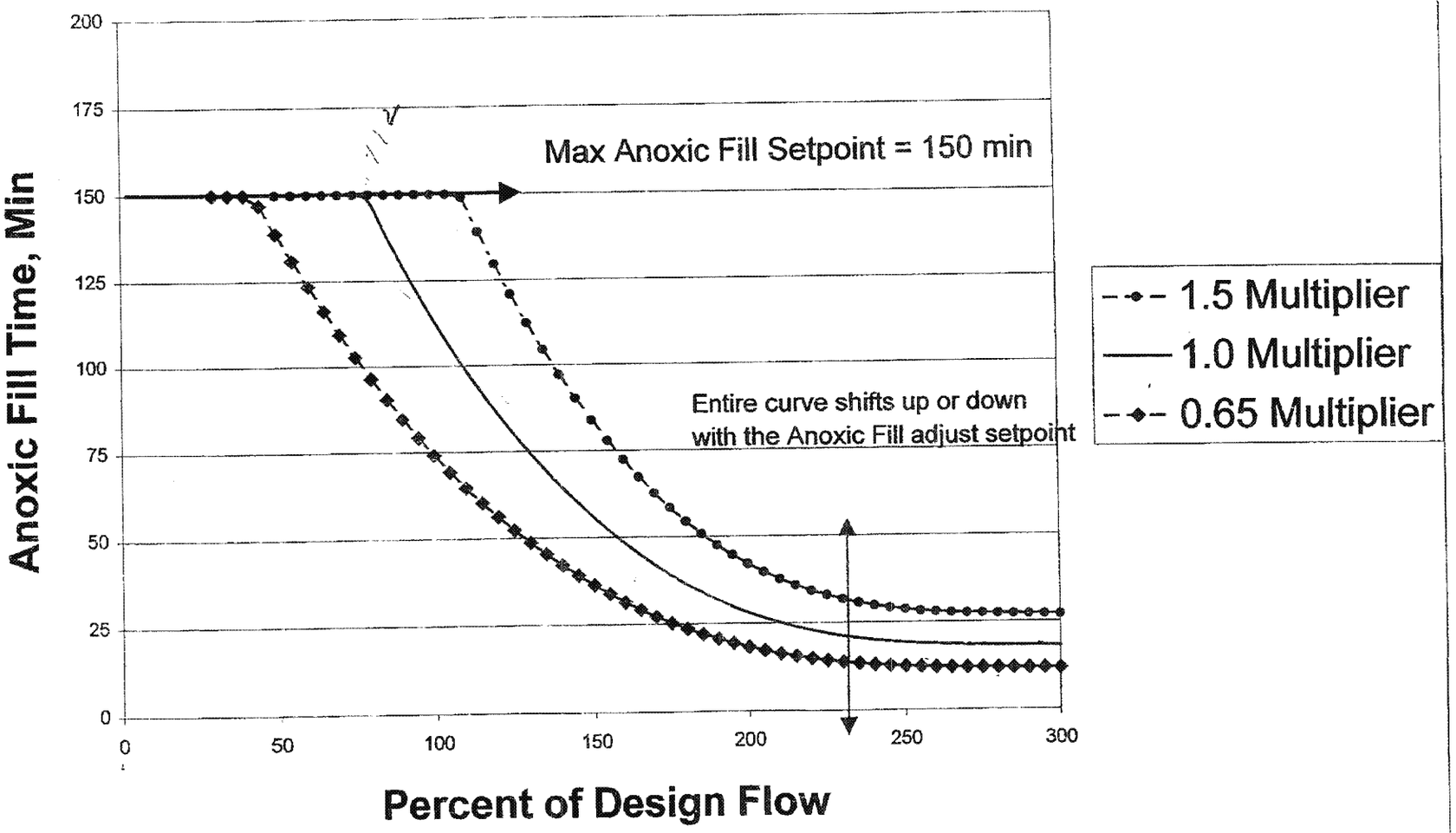
Aeration Time = Air Slope * %Design Flow + Air Adjust

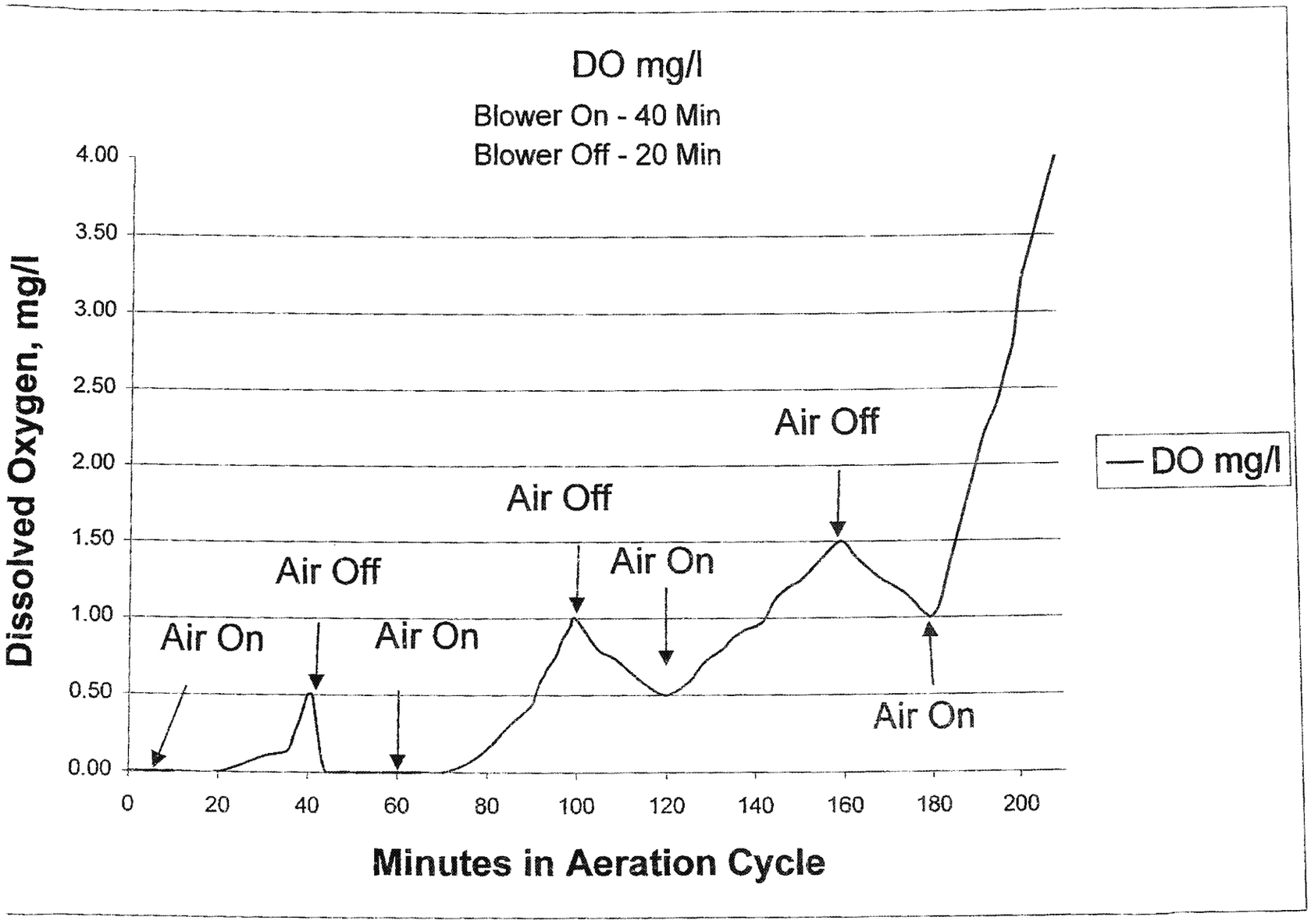
Example: at 115% of design flow, Air Slope of 140, and Air Adjust of -20,

Target Aeration Time = 140 * 1.15 -20 = 141 minutes



Effect of Anoxic Fill Setpoints





SLUG FEED DESCRIPTION

Slug Feed Description (ICI)

INTRODUCTION

All pumps, automatic valves, and blowers directly associated with the SBR tanks are controlled by the SBR control panel. Operating the selector switches on the panel front will manually operate each device. The manual operation should be used only when an equipment failure makes it unreasonable to continue with automatic operation or during maintenance. The selector switches bypass the outputs from the PLC thereby making them suitable for operation should the PLC fail.

INFLUENT EQ TANK

An influent equalization tank is used to store raw sewage until an SBR initiates a new cycle. The influent pumps are disabled until an SBR tank enters fill. The level in this tank only affects the SBR cycles if the Terminate React Level is reached. Terminate react will cause the tank that has been in aeration the longest (if multiple SBR basins are used) to advance to Settle. Ideally, the influent EQ tank will be able to hold all of the influent without the SBR changing cycle times automatically.

PLANT OPERATING MODES

There are several operating modes for the SBR system. The best treatment and most often used mode is multiple tanks operating. The other modes, single tank, and off (manual) are intended to be used when equipment failure has occurred, very low flows are being experienced, or maintenance is required. The operator selects the operating mode. Manual/auto selections are available either with switches on the control panel front or through the operator interface.

When a tank is selected to *manual*, the control system will disable all SBR automatic functions. The plant operator must operate every valve, pump, and blower associated with that tank when it is operated this way.

SELECTING A TANK TO AUTOMATIC

When selecting a tank to automatic operation, the level of the tank affects, which step the tank, is started in. If the tank is less than 0.5 feet above Bottom Water Level the tank is placed in idle. If the tank is higher than 0.5 feet above Bottom Water Level the tank is placed in Settle. If more than one SBR is placed into Settle, only one SBR will be allowed to decant at a time.

OFF MODE

When an SBR tank is selected *off* it will function the same as an Idle period. No mixing or aerating will occur for the tank, and raw influent does not enter the tank.

EQUIPMENT FAILLURES

Some equipment may be monitored for failure detection. The controller continuously monitors all such pumps, valves, and levels related to the SBR tanks. Valves are checked to make sure that they get to the open or closed positions as required by the control system. Pumps and blowers are checked to make sure that they are running when called to run by the control system. If a valve has been given a sufficient amount of time (60 to 90 seconds) to travel to the requested position, and it is not at that position, the valve will be alarmed. If a pump or blower has been given sufficient time (5 seconds) to generate a run signal and the signal has not been received then that device will be alarmed.

ALARM RESPONSE

When this option is included, the control system will not only monitor for equipment failures and annunciate, but will change plant operation in a predetermined manner. The change in operation does not occur at the time of failure, giving the plant operator five (5) minutes to make adjustments first.

POWER LOSS

Loss of utility power will result in a loss of power to the instrument system until the power is either restored or the emergency generator (if applicable) comes on line. When power is resumed, regardless of the source, the controller will reboot and control is resumed. If the power outage duration is less than 1 hour, the mode of operation prior to the power outage is the mode of operation on power restoration. If the power outage duration is greater than an hour, the program will restart the plant based upon tank levels.

SETPOINTS

The following data shows the available setpoints, the wording on the operator interface, the setpoints units, and the initial value.

Setpoint	Op. Int.	units	initial
Idle	IDLE	minutes	?
Maximum Idle	MAX IDLE	minutes	?
Aerated Idle	AIR IDLE	minutes	?
Maximum Fill	MAX FILL	minutes	?
Anoxic Time	ANOXIC	minutes	?
Anoxic Static %	STATIC %	percent	?
Minimum React	MIN REACT	minutes	?
Minimum Aeration	MIN AIR	minutes	?
Maximum Aeration	MAX AIR	minutes	?
Aeration on time	AIR ON	minutes	?
Aeration off time	AIR OFF	minutes	?
Settle Prep	SET PREP	minutes	?
Settle	SETTLE	minutes	?

Maximum Decant	MAX DEC	minutes	?
Top Water Level	TWL	feet	?
Bottom Water Level	BWL	feet	?
Initiate Fill	INT FILL	feet	?
EQ Terminate React	TERM AIR	feet	?

SETPOINT DESCRIPTIONS

It is likely that if the setpoints are adjusted improperly the SBR system will not give satisfactory effluent quality, and/or result in overflowing the tank (s). A series of calculations are provided by USFilter/Jet Tech Products to assist in determining the allowable range of setpoints for this plant.

Idle – This is the step where an SBR is waiting for another batch of raw sewage to treat. An SBR will exit Idle if the Idle time setpoint has expired, Maximum Idle time has expired, or the EQ tank Initiate Fill setpoint is reached.

Maximum Idle – Once an SBR is in Idle or Aerated Idle the Maximum Idle time begins. The SBR will sequence between Idle and Aerated Idle until the EQ tank Initiates Fill setpoint is reached or the Maximum Idle time has expired. When either of these two conditions have been met, the SBR enters a fill step.

Aerated Idle – This is the step where an SBR is aerating, but is still waiting for another batch of sewage to treat. An SBR will exit Aerated Idle if the Aerated Idle setpoint has expired, Maximum Idle setpoint has expired, or the EQ tank Initiate Fill setpoint is reached.

Maximum Fill – When an SBR enters one of the fill steps (i.e. anoxic fill or aerated fill) the Maximum Fill time begins. The SBR will remain in a fill step until the level reaches Top Water Level (TWL) or the Maximum Fill time has expired.

Anoxic Time – This step begins at the beginning of each cycle along will fill, and will continue until the Anoxic Time has expired. The fill portion will terminate when the SBR level reaches TWL or when the Maximum Fill time expires. The Anoxic portion of this treatment step will continue until the Anoxic Time has expired. If the Anoxic Time expires before an SBR exits fill, the remaining fill time will be in Aerated Fill.

Anoxic Static % - The Anoxic step is broken into Anoxic Static and Anoxic Mixed. This setpoint allows the operator to determine when the motive pump will be called to run. If the Anoxic Static % is set to 50%, the first half of the Anoxic Time will be Static and the second half will be Mixed.

Aeration – Consists of two setpoints (min/max air) which allows the operator to select the amount of Aeration time for based on the size of each batch. The Aeration time consists of two separate steps Aerated Fill and React. During a fill cycle, after the Maximum Anoxic Fill setpoint has been exceeded the remainder of the fill cycle will be spent in Aerated Fill. Once the fill cycle is complete the SBR will spend the remaining Aeration Time in React.

Minimum Aeration – This setpoint represents the amount of aeration time required if the water level does not exceed BWL for a treatment cycle.

Maximum Aeration – This setpoint represents the amount of aeration time required if the water level reaches TWL for a treatment cycle.

- The control system will utilize the min/max aeration setpoints to generate a curve representing the required aeration time at water levels between BWL and TWL. This allows the amount of aeration time to be in proportion to the size of each batch.

Aeration On/ Off Time – During Aeration, the blower run times will be based on the Aeration On and Off Time setpoints. Entering an Aeration Off setpoint of "0" will cause the blower (s) to run continuously during an aeration cycle. Entering an Aeration On setpoint of "30" and an Aeration Off setpoint of "60" will cause the blower (s) to cycle on for 30 minutes and off for 60 minutes continuously throughout an aeration cycle.

Minimum React – This setpoint ensures a minimum amount of React each cycle, regardless of the required Aeration time and the amount of Aerated Fill. The control system will make sure React cycle is not less than the Minimum React setpoint.

Settle Prep – This setpoint allows the operator to adjust the amount of time the motive pump will run after aeration is complete. This is done to protect the pumps from air lock and provides a flocculation period to enhance settleability in the SBR's.

Settle – This is a treatment step, which the SBR tank has no equipment running, no valves are open, allowing the solids in the tank to settle prior to entering the Decant.

- Though Settle Prep has a separate setpoint, the time the operator has entered into the Settle setpoint begins at the beginning of Settle Prep. The Settle Prep setpoint is only used to determine the amount of time the motive pumps run after aeration is complete.

Maximum Decant – When the SBR enters Decant the Maximum Decant time begins, this setpoint is designed as an emergency backup. The control system is monitoring the equipment for failure to perform required functions, if no equipment has failed and BWL is not reached within the time the operator has determined reasonable, the control system will alarm this condition and continue with the next treatment.

Top Water Level (TWL) – This is the level setpoint the operator selects to terminate fill. Under normal operating steps an SBR will not exceed the TWL setpoint.

Bottom Water Level (BWL) – This is the level setpoint the operator selects to terminate decant, indicating the end of a treatment cycle.

Emergency Top Water level (ETWL) – An ETWL float is included in each SBR. The software shuts down all equipment and opens the decant valve if the level in the SBR exceeds the Emergency Top Water Level float. Regardless of why the SBR reached that level, the controller will shut down all equipment and open the decant valve, then an alarm will sound to alert the operator that a malfunction has occurred. The decant valve will remain open (even if not in decant) until the level drops below the ETWL float.

Initiate Fill – this setpoint allows the operator to decide which in the influent EQ tank should initiate a fill cycle in the SBR. When the Initiate Fill setpoint is reached, any SBR in Idle will enter Anoxic Fill and begin a treatment cycle.

Terminate React – This is the only level in the EQ tank that affects the SBR cycles. Reaching the Terminate React Level will cause the tank that has been in aeration the longest to advance to Settle. Ideally, the influent EQ tank will be able to hold all of the influent without the SBR changing cycle times automatically.

APPENDIX B

NPDES PERMIT

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 5
77 WEST JACKSON BOULEVARD
CHICAGO, IL 60604-3590

AUTHORIZATION TO DISCHARGE UNDER THE
NATIONAL POLLUTANT DISCHARGE ELIMINATION SYSTEM

In compliance with the provisions of the Clean Water Act, as amended, the Bad River Band of Lake Superior Chippewa is authorized by the United States Environmental Protection Agency (U.S. EPA), Region 5, to discharge from a treatment facility operated by Bad River Utilities designated as the Bad River Wastewater Treatment Plant (formally the New Odanah WWSL) located at the Bad River Indian Reservation, Odanah, Wisconsin, Ashland County (E ½ of the SE 1/4 of Section 30, T48N, R2W) to Denomie Creek (interim) and to the Bad River (final), in accordance with effluent limitations, monitoring requirements, and other conditions set forth in Parts I, II, and III hereof.

This permit and the authorization to discharge shall expire at midnight, September 30, 2006. The permittee shall not discharge after the above date of expiration. In order to receive authorization to discharge beyond the date of expiration, the permittee shall submit such information and forms as are required by EPA no later than 180 days prior to the above date of expiration.

This permit shall become effective on the date of signature.

Signed and Dated 2 NOVEMBER, 2001

Treatment Facility Description:

The existing treatment facility consists of rotary screens followed by two sequencing batch reactors (SBR's). Effluent from the SBR's goes through ultra-violet disinfection and then discharges to Denomie Creek (Outfall 001). Waste activated sludge is pumped to an aerobic digester and then to one of two treatment/storage lagoons. The treatment/storage lagoons are the old aerated stabilization lagoons that were taken out of service in 1996. One lagoon is approximately 8 feet deep, 0.3 acres in area. The other lagoon is 6 feet deep and 3.38 acres in area. It is the latter lagoon that is being used at this time. The existing facility has an average design flow of 70,000 gallons per day.

This facility is scheduled to be expanded. Plans and specifications call for a new screening building with mechanical fine screens. The screened wastewater will flow by gravity to the existing SBR's which are planned to be converted for use as an influent equalization tank. Wastewater will then flow to a new two tank SBR system. Though some biological removal of phosphorus will occur in the system, a chemical feed system will be added for phosphorus removal. The existing ultra-violet disinfection system will be moved to a new building with an additional system being installed to handle peak flows. A new effluent line is being built, moving the discharge from Demonie Creek to the Bad River. The new outfall to the Bad River (Outfall 002) is scheduled to be completed at the same time as the scheduled expansion. Waste activated sludge will continue to be pumped to the existing aerobic digester for treatment. The permittee is looking at options for the final disposal of the sludge, whether it is to continue using the lagoons for treatment/storage, to land apply the sludge, or to haul it to another facility for treatment. The expanded facility will have an average design flow of 140,000 gallons per day.

A. Interim Effluent Limitations

From the Effective Date of the permit until the completion of construction of the wastewater treatment plant expansion or September 1, 2002, the permittee is authorized to discharge from Outfall 001. (The discharge to Denomie Creek.) Such discharge shall be limited and monitored by the permittee as specified below and in Part I.C. The following design flow was used in determining the limitations below, but is not to be considered a limitation or actual capacity: 0.070 mgd.

Effluent Parameter	Continuous Discharge Limitations				
	30 Day Average During Discharge			7 Day Average During Discharge	
	lbs/d	mg/L	% Removal*	lbs/d	mg/L
Biochemical Oxygen Demand (BOD_5)	18	30	85	26	45
Total Suspended Solids (TSS)	18	30	85	26	45
Total Phosphorus (as P)	0.58	1.0			
E. coli		126 E. coli/100 ml**			

The pH shall not be less than 6.0 nor greater than 9.0.

There shall be no discharge of floating solids or visible foam in other than trace amounts.

The discharge shall not contain oil or other substances in amounts sufficient to create a visible sheen on the surface of the receiving waters.

NOTE: lbs/d = pounds per day
mg/L = milligrams per liter

* For the average during the discharge period, the effluent concentration shall not exceed 15 percent for $CBOD_5$ and TSS of the arithmetic mean of the value for influent samples for $CBOD_5$ and TSS collected during the related treatment period (since last discharge).

** Geometric Mean (See Part II, Section E.7.b.)

B. Final Effluent Limitations

From the completion of construction of the wastewater treatment plant expansion or September 2, 2002, until the Expiration Date of the permit, the permittee is authorized to discharge from Outfall 002. (The discharge to the Bad River.) Such discharge shall be limited and monitored by the permittee as specified below and in Part I.C. The following design flow was used in determining the limitations below, but is not to be considered a limitation or actual capacity: 0.140 mgd.

Effluent Parameter	Continuous Discharge Limitations				
	30 Day Average During Discharge			7 Day Average During Discharge	
	lbs/d	mg/L	% Removal*	lbs/d	mg/L
Biochemical Oxygen Demand (BOD_5)	35	30	85	53	45
Total Suspended Solids (TSS)	35	30	85	53	45
Total Phosphorus (as P)	1.2	1.0			
E. coli		126 E. coli/100 ml**			

The pH shall not be less than 6.0 nor greater than 9.0.

There shall be no discharge of floating solids or visible foam in other than trace amounts.

The discharge shall not contain oil or other substances in amounts sufficient to create a visible sheen on the surface of the receiving waters.

NOTE: lbs/d = pounds per day
mg/L = milligrams per liter

* For the average during the discharge period, the effluent concentration shall not exceed 15 percent for $CBOD_5$ and TSS of the arithmetic mean of the value for influent samples for $CBOD_5$ and TSS collected during the related treatment period (since last discharge).

** Geometric Mean (See Part II, Section E.7.b.)

C. Interim and Final Monitoring Requirements

Parameter	Frequency	Sample Type	Notes
Influent Flow	Daily	Continuous	
Influent BOD_5	2 x Weekly	24 hour composite	
Influent TSS	2 x Weekly	24 hour composite	
Influent pH	2 x Weekly	Grab	(1)
Influent Phosphorus (Total as P)	2 x Weekly	24 hour composite	
Effluent Flow	Daily	Continuous	
Effluent BOD_5	2 x Weekly	24 hour composite	
Effluent TSS	2 x Weekly	24 hour composite	
Effluent E. coli	2 x Weekly	Grab	(1)
Effluent D.O.	2 x Weekly	Grab	(1)
Effluent pH	2 x Weekly	Grab	
Effluent Ammonia	2 x Weekly	24 hour composite	
Effluent Phosphorus (Total as P)	2 x Weekly	24 hour composite	

Notes:

(1) Analyze immediately.

In addition to the monitoring required above, the permittee shall monitor the effluent discharged to the Bad River (Outfall 002) for the constituents listed below. This monitoring is an application requirement of 40 CFR part 122.21(j), effective December 2, 1999. Testing shall be conducted in May, 2005, July, 2005, and September, 2005.

Total Residual Chlorine	Grab
Total Kjeldahl Nitrogen	24 hour composite
Nitrate plus Nitrite Nitrogen	24 hour composite
Oil and Grease	Grab
Total Dissolved Solids	24 hour composite

This data and the data collected through routine monitoring shall be used in completing the renewal application due 180 days prior to the expiration of this permit.

D. Compliance Schedule

The permittee is planning to expand the wastewater treatment plant. The expansion includes the elimination of the existing outfall to Denomie Creek and the construction of a new outfall to the Bad River. The wastewater treatment plant expansion project should be completed and obtain operational level by September 1, 2002.

1. By June 1, 2002, the permittee shall submit to EPA at the address in Part I.E.2, the status of the wastewater treatment plant expansion project. The status report shall include, at a minimum, the percent completion of the project and whether the project will be completed and obtain operational level by September 1, 2002.

2. By June 1, 2002, the permittee shall request that the permit be modified, if needed, to extend the discharge period to Denomie Creek.

3. If no request to modify the permit is received, there shall be no discharge to Denomie Creek from the facility after September 1, 2002.

E. Special Conditions

1. Representative samples and measurements taken as required herein shall be representative of the volume and nature of the monitored discharge.

2. Reporting - The permittee shall record all monitoring results required by Part I.A., Part I.B., and Part I.C. on Discharge Monitoring Report (DMR) forms. One form of each shall be used for each month whether or not a discharge occurred during the month.

The DMR forms shall be mailed to EPA, and a copy mailed to the WDNR*, on a quarterly basis, and postmarked no later than the 21st day of the month (April, July, October, January) following the quarter for which the monitoring was completed. The permittee shall retain a copy of all reports submitted. All reports shall be mailed to:

U.S. Environmental Protection Agency
Water Division - Water Enforcement and Compliance
Assurance Branch
Attention: Chief, Minnesota Section - WC-15J
77 West Jackson Boulevard
Chicago, Illinois 60604

Wisconsin Department of Natural Resources
Spooner District Office; Attn: Sherie Snobank
810 W. Maple
Spooner, Wisconsin 54801

3. The treatment plan shall be operated by a certified operator for the class of wastewater treatment provided as soon as possible, but not later than 12 months from the effective date of this permit.

   The permittee shall submit to the U.S. EPA at the address in Part I.E.2, a report within 14 days of the completion of the certification process indicating, a) the date the operator received certification and a copy of the certification, or b) that the certification was not completed, the reason for non-completion, and the anticipated completion date.

4. In addition to the sludge land application requirements in Part III of the permit, the following requirements also apply to the permittee;

   a. The application contractor has received all necessary information to comply with applicable provisions of 40 CFR Part 503.

   b. Duty to mitigate. The permittee shall take all reasonable steps to minimize any sludge use or disposal in violation of this permit.

   c. If the permittee monitors any pollutant more frequently than required by the permit, using test procedures approved under 40 CFR Part 136 or Part 503, the results of this monitoring shall be included in the reporting of data submitted to the Agency.

   d. The permittee shall comply with existing federal regulations governing sewage sludge disposal.

   e. The permittee shall comply with standards for sewage sludge use or disposal established under Section 405(d) of the CWA within the time provided in the regulations that establish the standards for sewage sludge use or disposal even if the permit has not been modified to incorporate the requirement.

   f. The permittee shall ensure that the applicable requirements in 40 CFR Part 503 are met when the sewage sludge is applied to the land, placed on a surface disposal site, or fired in a sewage sludge incinerator.

5. Pretreatment Requirements

   a. The permittee shall comply with all applicable requirements 40 CFR Part 403 to prevent any pass through of pollutants or any inhibition or disruption of the permittee's facility, its treatment process, or its sludge process or disposal, which contributes to the violation of the conditions of this permit or any applicable federal, state, or local law or regulation.

b. The permittee shall prohibit the discharge of the following to its wastewater treatment facility:

1. pollutants which create a fire or explosion hazard, including any discharge with a flash point less than 60 degrees C (140 degrees F);

2. pollutants which would cause corrosive structural damage, including any waste stream with a pH of less than 5.0;

3. solid or viscous pollutants which would obstruct flow;

4. heat that would inhibit biological activity, including any discharge that would cause the temperature of the waste stream at the WWTF to exceed 40 degrees C (104 degrees F);

5. pollutants which produce toxic gases, vapors, or fumes that may endanger the health or safety of workers; or

6. new sources of non-contact cooling waters, unless there are no cost-effective alternatives.

c. The permittee shall prohibit new discharges of non-contact cooling waters unless there are no cost-effective alternatives. Existing discharges of non-contact cooling water to the WWTP shall be eliminated, where elimination is cost-effective, or where an infiltration/inflow analysis and sewer system evaluation survey indicates the need for such removal.

d. If the permittee accepts trucked-in wastes, the permittee shall evaluate the trucked in waste prior to acceptance in the same manner as it monitors sewered wastes. The permittee shall accept trucked-in wastes only at specifically designated points.

e. The permittee shall make no agreement with any user that would allow the user to contribute an amount or strength of wastewater that would cause violation of any limitation or requirement in this permit, or any applicable federal, state, or local law or regulation.

6. During the wastewater treatment expansion project, the permittee shall continue to operate the existing facility to provide optimum treatment at all times.

7. There shall be no discharge to waters of the U.S. from the sludge treatment/storage lagoons except in accordance with Part II.B.4.